State Board of Health of New York.

REPORT

ON THE

POTABLE WATER SUPPLY

OF THE

CITY OF NEW YORK.

[EXTRACT FROM NINTH ANNUAL REPORT.]

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REPORT.

On the thirteenth of June application was made by the official head of New York city, Hon. Abram S. Hewitt, to the State Board of Health requesting a thorough examination to be made into the sanitary conditions surrounding the sources of supply and storage of the waters transmitted to the city of New York for consumption, and that such regulations be framed as would afford the largest measure of protection to the inhabitants of the city against the pollution of the water. The State Board at once responded to this application, engaged engineers and made a thorough examination of the water-sheds, mapping out every source of pollution threatening the water supply, exhibiting these on elaborate maps, and by photographs taken on the spot which latter have been reproduced by photo-engravings. The result of this examination appears in the exhaustive report presented by the Engineer, Professor C. C. Brown, concurred in by Consulting Engineer Emil Kuichling. On this report, and upon all the other information possessed by the Board, were formulated, in accordance with chapter 543 of the Laws of 1885, certain rules for the sanitary protection of the water-sheds, which will be found in their proper place.

The general principle upon which we have proceeded in framing the accompanying rules is as follows:

First. The establishment of a marginal zone around every lake, pond or reservoir adjacent to every spring,

stream or natural water-course of any kind on the entire water-shed of the Croton river, and on those portions of the water-sheds of the Bronx and Byram rivers now used for the water supply of the city of New York. The width of said zone adjacent to the lakes, ponds and reservoirs has been taken at fifty feet; while for that adjacent to the tributaries the nominal distance of thirty feet has been prescribed. From these zones it is the purpose of the rules to exclude all kinds of contamination upon or below the surface of the ground.

Second. Recognizing the fact that many habitations and vested interests are adjacent to the lakes, ponds and reservoirs and their tributaries, which must be considered, a second zone has been established adjacent to the first named which is 200 feet wide around lakes, ponds or reservoirs, and 100 feet wide around or along tributaries. From this zone it is the intention to prevent defilement of the surface soil and the subsoil; and to this end restrictions as to the manner of maintaining sources of actual or possible pollution have been made. The restrictions are based upon the fundamental principle that the accidental deposit of solid organic wastes must be retained upon the surface of the ground or transferred by natural agencies over such distance as will render their entrance into the waters highly improbable. While the State Board of Health, in establishing these limits for filtration or percolation of sewage through soil, does not fix the same as absolutely safe under all circumstances, yet in considering the general topographical and geological characteristics of the water-sheds, lying in the counties of Westchester, Putnam and Dutchess, it is thought that such limits will afford reasonable guarantee of the resulting discharge being safe when not in too large volume. To provide for every conceivable condition is manifestly impossible. and hence only general rules can be formulated. When the rock or other impervious stratum is covered only by a thin layer of very porous material, like gravel, or when the entire subsoil is formed of such material, this distance must obviously be increased. On the other hand, when, owing to the topographical peculiarities, it is impossible to comply with the strict provisions of the

above rules, proper modification may be permitted by the substitution of such devices or constructions as shall receive the special approval of the State Board of Health.

It is also recognized that improvements in methods of disposal of all kinds of waste are from time to time effected, and, therefore, provision is made to enable those who are more or less annoyed by the operation of the rules to take advantage of the improvements upon proper application to the State Board of Health.

While not desirous of burdening itself with the extra work involved in hearing applications for modification of rules and determining upon their merits, the State Board feels it cannot shirk the responsibility, nor delegate the power conferred upon it by law to another. As the sanitary adviser of the local boards of health throughout the counties included in the area of the watersheds, and having more or less supervision of their work in the protection of the public health, it considers it better to stand ready to assume this added labor rather than permit the same to be acted upon by the various local boards, where much difference of opinion might materially affect its efficacy.

With reference to the tributaries to lakes, ponds and reservoirs, the limit in which restrictions have been imposed have been taken somewhat smaller than in the case of the larger bodies of water, in view of the fact, that before such polluted matter can reach the reservoirs or ponds from which the supply is taken, it is probable, that certain purification will have been accomplished by flow through a greater or less length in open watercourses, and by the exposure of such matter to the modifying or destroying influences therein contained.

Similarly with liquid wastes leaching from the solids that have accidently been deposited, whereby percola-

tion or filtration through or over a sufficient width of earth or natural soil has been provided.

The most dangerous of all organic wastes are universally recognized to be human excreta in the broadest sense of the term. Hence the rules with reference to privies, vaults, cesspools, etc.

Next in the order of danger come the excreta from the various domestic animals and the derivatives of such manures, compounds, etc. While these may not contain specific poisons which act violently upon the health of human beings, they nevertheless produce favorable conditions for the development of such specific poisons, be the origin chemical or biological (ptomaines or bacteria).

Lastly come ordinary household slops and manufacturing wastes. For these similar restrictions have been made as to their deposit within a certain distance of the water's edge of any lake, pond or reservoir or tributary. It may be remarked, that wherever the words "water's edge" are used, they are understood to refer to the *edge* when the water is at its highest stage, also in case the banks or shores of the water-courses are precipitous or very abrupt, with little or no intervening land between the foot of such declivity and said high-water mark, that the upper edge of such bank will be considered as the point from which distance is to be estimated. It will be seen, that the restrictions for such places are in general less severe than for the more dangerous nuisances.

The operation of these rules, so far as polluting organic matter is concerned, refers only to such as is putrescible. It leaves non-putrescible substances to be taken care of by the general sense of decency that the people of the place possess.

It also urgently recommends to all parties dealing with dead animal matter, that may be buried in the ground outside of prohibited limits, to hasten decomposition of such matter by the liberal use of quick-lime or other agents which will greatly accelerate decomposition of such material as well as diminish the dangers arising therefrom. The investigations of the State Board of Health, as well as similar investigations by sanitary authorities in other places, have shown a very great danger resulting to the purity of public water supplies by the leachings from cemeteries. The distance through which infected matter can be carried from these sources varies with the character of the subsoil. It is desirable to remove the cemeteries as far as possible from the waters, as above defined, in any lakes, ponds or reservoirs or tributaries. While the remains of the dead at present interred should not be needlessly disturbed, all future interments within 250 feet of the margin of the water supply should be prohibited.

With reference to the drainage from manured fields and gardens, much may be said in the way of restriction in so far as the character of the fertilizer is concerned. Its modes of application are exceedingly various. In a general sense the rules must be made within a reasonable compass. The restrictions are that the manure shall immediately be thoroughly incorporated with the surface soil in order to subject it at once to the processes of nitrification; also, that the amount of manure thus deposited and incorporated shall not be excessive in amount or concentrated at one or more points.

Furthermore, that while the use of fertilizers, within the limits to which the restrictions in general apply, may not be absolutely prohibited, yet it is deemed

advisable to prohibit the use of certain kinds of fertilizers, in the first rank of which human excreta may be placed. The amount and degree of concentration of other less objectionable fertilizers must also be confined to the smallest possible amount.

This restriction is made because the soluble element of all fertilizers after reaching the water tends to stimulate enormously the development of all kinds of aquatic vegetation, some of which, as is well known, becomes, under certain circumstances, exceedingly disagreeable by imparting a peculiar taste and odor to the water. Therefore, in the restricted territory, immediately adjoining all large bodies of water and their tributaries, the use of such fertilizers should be limited to the least possible amount.

While the rules do not enumerate all possible sources of pollution, or even all those which have been specified in the engineering report, it has not been thought expedient to incumber them with a multitude of details, the execution of which would, in all probability, be performed by aqueduct commissioners or their agents spontaneously. In this class of details may be placed the drainage and improvements or exclusion of swamps, bogs and marshes, and the removal of improper surface vegetation, the excavation of shallow places in the reservoir, the removal of deposits and shoals more or less impregnated with organic matter that have accumulated at the mouths of the tributaries of the various lakes, ponds and reservoirs; the location and construction of roads and highways in such manner that the drainage waters therefrom shall be insured a reasonable degree of purification by flow through or over the surface of the land before reaching the principal water-courses or stored waters.

Special attention of the local authorities is directed to the above point, with the earnest recommendation that suitable measures be taken by them to bring about the accomplishment of the purpose herein sought; namely, the exclusion of offensive organic matter from the drinking water furnished to the metropolis.

It is a source of regret that the industrial interests of the water-sheds are somewhat affected by this same purpose; nevertheless, it must be regarded as a kind of offset to the advantage resulting from proximity of such establishments to the great central marts of the country; and it is only just that these advantages be attended with corresponding obligations and responsibilities. The purity of the water supply furnished to the enormous population absolutely dependent upon it for the preservation of health in the great city, is of vastly greater consequence than the trivial pecuniary advantage that may accrue to the manufacturer by saving the expense of properly purifying all elements of pollution emanating from his establishment.

Rules and Regulations

for the

SANITARY PROTECTION

of the

CROTON RIVER AND ITS TRIBUTARIES,

in the

Counties of Westchester, Putnam and Dutchess, and of so much of the Bronx and Byram Rivers and their Tributaries in the County of Westchester, as are now used for the Supply of Water for the City of New York.

Rules and Regulations.

Privies Adjacent to Lakes, Ponds or Reservoirs, and Water-Courses.

First.—No privy, or place for the deposit or storage of human excreta, shall be constructed, located or maintained within fifty (50) feet, horizontal measurement, of the high-water mark of any lake, pond or reservoir, or within thirty (30) feet, horizontal measurement, of the high-water mark or precipitous bank of any spring, stream or water-course of any kind, tributary to said lakes, ponds or reservoirs on the entire water-shed of the Croton river, or on those portions of the water-sheds of the Bronx and Byram rivers now used for the water supply of the city of New York.

Second.—No privy vault, pit or cesspool, or non-transportable receptacle of any kind for the reception or storage of human excreta shall be constructed, located or maintained within two hundred and fifty (250) feet, horizontal measurement, of the high-water mark of any lake, pond or reservoir, or within one hundred and thirty (130) feet, horizontal measurement, of the high-water mark or the precipitous bank of any spring, stream or water-course of any kind on the entire water-shed of the Croton river, or on those portions of the water-sheds of the Bronx and Byram rivers now used for the water supply of the city of New York.

Third.—Every privy, or place for the deposit of human excreta, which is constructed, located or maintained between the aforesaid limits of fifty (50) feet and two hundred and fifty (250) feet, horizontal measurement, of the high-water

mark of any lake, pond or reservoir, or within the limits of thirty (30) feet and one hundred and thirty (130) feet, horizontal measurement, or the high-water mark or precipitous bank of any spring, stream or water-course tributary to such lakes, ponds or reservoirs, on the entire water-shed of the Croton river, or on those portions of the water-sheds of the Bronx and Byram rivers now used for the water supply of the city of New York, and from which the said excreta are not at once removed automatically, by means of suitable water-tight pipes or conduits, to some proper place of ultimate disposal, as hereinafter provided, shall be arranged in such manner that all said excreta shall be received and temporarily maintained in suitable vessels or receptacles, which shall at all times be maintained in an absolutely water-tight condition, and which will admit of convenient removal to some place of ultimate disposal, as hereinafter set forth.

Fourth.—Whenever it shall be found that, owing to the porous character of the soil, the height and flow of the surface and subsoil waters, the steepness of the slopes, or other special condition of the locality, the excremental matter from any privy, cesspool or other receptacle for human excreta, situated within the limits hereinbefore provided, may be washed over the surface or through the subsoil into any lake, pond or reservoir, or into any spring, stream or water-course tributary to such lake, pond or reservoir on said water-shed of the Croton river, or on those portions of the water-sheds of the Bronx and Byram rivers now used for the water supply of the city of New York, without having been thereby, in the judgment of the State Board of Health, sufficiently purified, then the said privy, cesspool or other receptacle for human excreta shall, after due notice to the owner thereof, be removed to such greater distances from said high-water marks as shall be considered safe and proper by the State Board of Health.

Fifth.— All said receptacles for human excreta must be provided with tightly-fitting covers, which shall be securely applied during the process of removal, so that no portion of the contents of said receptacle shall escape therefrom while being transported from the privy to the place of ultimate disposal.

Sixth.— A sufficient number of duplicate receptacles of said general description or character shall be provided, so that when one of the same is removed from the privy an empty receptacle may at once be substituted in its place.

Seventh.— All such receptacles, when filled, shall be removed to some place of ultimate disposal as hereinafter provided, and said receptacles themselves shall be thoroughly cleansed and deodorized as often as may be found necessary to maintain the privy in proper sanitary condition, and to prevent an overflow of the excreta upon the soil or floor of said privy.

Eighth.— The excreta collected in the aforesaid receptacle shall be removed to some convenient place of ultimate disposal, which shall be not less than two hundred and fifty (250) feet from the high-water mark or precipitous bank of any lake, pond or reservoir, and not less than one hundred and thirty (130) feet from the high-water mark or precipitous bank of any stream, spring or water-course of any kind on the entire water-shed of the Croton river, or on those portions of the water-sheds of the Bronx and Byram rivers now used for the water supply of the city of New York, and from which they can not be directly washed by rain, or melting snow, or otherwise over the surface of the ground into any lake, pond or reservoir, or into any spring, stream, water-course, channel or well which is tributary thereto on the entire water-shed of the Croton river, or on those portions of the water-sheds of the Bronx and Byram rivers now used for the water supply of the city of New York.

Ninth.— In the absence of any other manner of disposal of the excreta collected as aforesaid, which is not specifically

approved by the State Board of Health after due submission to said board, the said excreta shall be disposed of by digging the same into the surface soil or by burial in trenches of moderate depth in places where the character of the sub-soil and the depth of the ground-water level will afford ample security both against the undue pollution of such ground-water and the soil itself, and for the efficient filtration of the liquid contents of the said receptacles.

Tenth.—The removal of the aforesaid receptacles from the privies shall be conducted in such manner as to cause as little inconvenience or annoyance to the occupants of the premises as is compatible with proper management of the work.

House Slops, Sink Wastes, Laundry Water and other Similar Sewage.

Eleventh.—No sewage, house slops, sink wastes, water in which clothes or bedding have been washed or rinsed, nor any other polluted water or liquid shall be thrown or discharged directly into any lake, pond or reservoir as aforesaid, or into any spring, stream or water-course tributary thereto, nor shall any such aforesaid liquid or solid matter or other polluted liquid be thrown or discharged upon the surface of the ground or into the ground below the surface in any manner whereby the same may flow into any lake, pond or reservoir, or into any spring, stream or water-course tributary thereto within fifty (50) feet, horizontal measurement, or the high-water mark in any lake, pond or reservoir, or within thirty (30) feet of the high-water mark or the precipitous bank of any spring, stream or water-course tributary to said lakes, ponds or reservoirs.

Twelfth.—The foregoing rule shall be considered applicable only where the quantity of such polluted water or liquid wastes is small, such as may be derived from a single family; but when relatively large quantities of such wastes are produced and are thrown or discharged upon or below the surface of

the ground at any point beyond the aforesaid limits, in such manner or volume as to cause the same to flow over the surrace of the ground, or through it below the surface, into any lake, pond or reservoir, or into any spring, stream or water-course tributary thereto, without having been thereby, in the judgment of the State Board of Health, sufficiently purified; then, upon due notice to the owners or occupants of the premises from which such discharge comes, the aforesaid distances shall be increased respectively to such other limits as shall appear justified to said State Board of Health.

Thirteenth.—In case that human excrement is mingled with any of the aforesaid polluted water or other sewage, the discharge of the same upon or below the surface of the ground will be governed by the rule relating to privies.

Fourteenth.—No clothes or unclean objects of any kind shall be washed in any lake, pond or reservoir, or in any spring, stream or water-course tributary thereto.

Garbage and Refuse.

Fifteenth.—No garbage or putrescible refuse of any kind shall be thrown or discharged directly into any lake, pond or reservoir, or into any spring, stream or water-course tributary thereto; nor shall any such substances be placed in large quantities upon or below the surface of the ground where they may be washed into any lake, pond or reservoir, or into any spring, stream or water-course tributary thereto, within one hundred (100) feet of the high-water mark in any lake, pond or reservoir, or within fifty (50) feet of the high-water mark or precipitous bank of any spring, stream or water-course tributary to said lakes, ponds or reservoirs.

Sixteenth.—The State Board of Health shall have the right to increase the aforesaid distances in all cases where, in its

judgment, it may appear that injury to the purity of the water results from the deposit or storage of garbage or putrescible refuse as aforesaid.

Seventeenth.—Where it becomes impracticable to comply with the foregoing rules so far as the disposal of garbage or putrescible refuse upon or below the surface of the ground is concerned, then suitable water-tight receptacles must be provided and be so located and maintained on the premises that none of the contents thereof shall escape and pollute the waters as heretofore indicated.

Manures, Composts and Similar Matter.

Eighteenth.—No stable, pig-sty, hen-house, barn-yard, hog-yard, hitching or standing-place for horses or cattle, or other place where animal manure accumulates, shall be constructed, located or maintained within one hundred (100) feet of the high-water mark in any lake, pond or reservoir, or within fifty (50) feet of the high-water mark or precipitous bank of any spring, stream or water-course tributary to said lakes, ponds or reservoirs.

Nineteenth.—No stable, pig-sty, hen-house, barn-yard, hog-yard, hitching or standing-place for horses or cattle, or other place where animal manure accumulates, shall be arranged or maintained in such manner that the washings or drainage therefrom may flow through open or covered drains or channels into any pond, lake or reservoir, or into any spring, stream or water-course tributary thereto, without having undergone proper purification.

Twentieth.—The foregoing rules shall also apply to composts and to masses of fermented or decayed fruit, vegetables, roots grain, sawdust, leaves, or other vegetable substances, which may be used either alone or in combination with other matter as manure, or as food for domestic animals.

Dead Animals, Vegetable Refuse and Manufacturing Wastes.

Twenty-first.—No dead animal, bird, fowl, fish or reptile, or parts thereof, nor any filthy or decaying matter of animal or vegetable origin derived from human habitations, barns or stables, nor any putrescible matter or waste product or polluted liquid from any slaughter-houses, creameries, condensed milk factories, cheese factories, breweries, distilleries, cider-mills, wine or beer vaults, sugar or glucose factories, tanneries, woolen-mills, paper-mills, pulp-mills, saw-mills, or other manufactories, shall be thrown, discharged, drained or washed into any lake, pond or reservoir, or into any spring, stream or water-course tributary thereto.

Twenty-second.—No dead animal, bird, fish, fowl or reptile, or any part thereof, shall be buried in the ground within two hundred and fifty (250) feet of the high-water mark of any lake, pond or reservoir, or within one hundred and thirty (130) feet of the high-water mark or precipitous bank of any spring, stream or water-course tributary thereto.

Twenty-third.—No live sheep or other animals shall be washed in any lake, pond or reservoir, or in any spring, stream or water-course tributary thereto; neither shall any person swim, bathe or wash in any of said lakes, ponds or reservoirs, or in the streams tributary thereto.

Twenty-fourth.—The waste liquids which may be polluted with putrescible or deleterious organic matter from any of the operations above indicated shall all be thoroughly filtered or otherwise purified before being allowed to escape into any lake, pond or reservoir, or into any spring, stream or water-course tributary thereto.

Cemeteries.

Twenty-fifth.—No interment shall be made in any cemetery or other place of burial on the entire water-shed of the Croton river, or on those portions of the water-sheds of the Bronx and Byram rivers now used for the water supply of the city of New

York, within two hundred and fifty (250) feet, horizontal measurement, of the high-water mark in any lake, pond or reservoir, or within one hundred and thirty (130) feet, horizontal measurement, of the high-water mark or precipitous bank of any spring, stream or water-course tributary to such lakes, ponds or reservoirs.

Twenty-sixth.— Whenever it shall be brought to the notice of the State Board of Health that, owing to the porous character of the soil, the height and flow of the subsoil waters, the steepness of the slopes or other special conditions of the locality, the percolation or drainage from any cemetery or place of burial is polluting the waters of any lake, pond or reservoir, or of any spring, stream or water-course tributary thereto, the aforesaid limits within which interments are not permitted shall be extended as much further from said high-water marks as shall be considered safe and proper by the State Board of Health.

Provision for Appeals to State Board of Health.

Twenty-seventh.— Wherever any system of treating excremental matter from any dwelling, hotel, stable, factory or other building from which such matter may be discharged, by means of subsurface irrigation, filtration, chemical process or otherwise, has already been established, and now discharges the effluent liquid or solid matter anywhere within two hundred and fifty (250) feet, horizontal measurement, of the high-water mark in any lake, pond or reservoir, or within one hundred and thirty (130) feet, horizontal measurement, of the high-water mark or precipitous bank of any spring, stream or water-course tributary to such lakes, ponds or reservoirs on said water-sheds, such discharge shall no longer be permitted, but must be carried to some suitable point beyond said limits respectively, unless especially allowed by the State Board of Health.

Twenty-eighth.— Wherever any system of treating house-slops, sink-wastes, laundry water, stable drainage, factory wastes or refuse, garbage, or any other putrescible waste matter or the drainage therefrom, by means of subsurface irrigation, filtration, chemical process or otherwise, has already been established and now discharges the effluent liquid or solid matter anywhere within fifty (50) feet, horizontal measurement, of the high-water mark in any lake, pond or reservoir, or within thirty (30) feet, horizontal measurement, of the high-water mark or precipitous bank of any tributary spring, stream or water-course, such discharge shall no longer be permitted, but must be carried to some suitable point beyond said limits respectively, unless specially allowed by the State Board of Health.

Penalty.

In accordance with section 2 of chapter 543 of the Laws of 1885, a penalty of not less than fifty nor more than one hundred dollars is hereby imposed upon any corporation, person or persons, guilty of a violation of, or non-compliance with any of the above given mandatory rules or regulations; to be recovered under said act.

At a special meeting of the State Board of Health, held on the 15th of March, 1889, at the Capitol, in the city of Albany, the foregoing rules and regulations were made, ordained and established, pursuant to chapter 543 of the Laws of 1885, for the protection of the water-shed of the Croton river and its tributaries in the counties of Westchester, Putnam and Dutchess, and of so much of the Bronx and Byram rivers and their tributaries in the county of Westchester as are now used for the supply of water for the city of New York.

THOS. NEWBOLD,

President.

LEWIS BALCH, M. D.,

Secretary and Executive Officer.

White Plains, N. Y., *March* 26, 1889.

Pursuant to chapter 543 of the Laws of 1885, as amended by chapter 52 of the Laws of 1888, I, Jackson O. Dykman, a justice of the Supreme Court of the State of New York, in and for the second judicial district, within which district the counties of Westchester, Putnam and Dutchess are situated, do hereby approve of the foregoing rules and regulations, made, ordained and established by the State Board of Health on the 15th day of March, 1889, for the sanitary protection of the Croton river and its tributaries, and of so much of the Bronx and Byram rivers as are now used for the supply of water for the city of New York.

J. O. DYKMAN,
Justice Supreme Court.

ENGINEER'S REPORT.

REPORT

OF

Inspection of the Croton Water-shed.

By CHARLES C. BROWN, Civil Engineer.

Union College, Schenectady, N. Y., *January* 26, 1889.

Lewis Balch, M. D.,

Secretary State Board of Health:

Dear Sir.— The following report of an inspection of the water-shed of the Croton river, from which the city of New York draws the greater part of its water supply, is respectfully submitted, together with such other data as were obtainable, and with such deductions and comments as have been deemed advisable and proper.

In making the inspection, the following classification of the various impurities to which surface water is subject was borne in mind:

(a.) That polluting materials may be entirely innocuous, either in themselves or in their effects upon other substances in the water;

(b.) That the substances having a deleterious effect upon the water, as a potable water, may be of inorganic or of organic origin;

(c.) That the organic matters may be of vegetable or of animal origin; and

(d.) That pollution from human excreta is more dangerous to the users of the polluted water than pollution from other animal sources or from vegetable organisms.

It is recognized that many of these substances become obnoxious indirectly also, by stimulating the development of various kinds of aquatic life, for which they furnish the necessary food.

The plan of the report is as follows:

I. A description of the natural characteristics of the water-shed, giving its location, extent, geological formation, character of surface and soil, amount of rainfall and of river-discharge, including therein a statement of the natural sources of pollution to the water supply, both inorganic and organic.

II. A statement of the artificial sources of pollution of the water supply by inorganic and organic matter. A knowledge of these sources was obtained by two different and independent personal inspections.

(A.) The first of these was made under the direction of the health department of the city of New York in December, 1884, and January, 1885. The results of this inspection, condensed and tabulated from the report of Mr. Alfred Lucas, the inspector, are given in Table III, with a statement of the scope and detail thereof, as inferred from the second more extended inspection. This latter was made by Mr. Charles C. Brown, during July, August and September, 1888. The results are given in detail as follows:

(B.) Table IV gives the number of possible individual sources of pollution to each water-course in the entire water-shed, and the number of these sources requiring some measure of attention. An explanation of the differences in plan of the two inspections and of the numerical differences accompanies the table.

(C.) Tables III and IV are accompanied by four plates of maps and sketches, Plates I to IV, which show with sufficient accuracy for the purposes of this report, the location of practically every building on that portion of the water-shed lying in this State; and in the cases of some of the villages the

sketches also show details of direction of surface drainage, location of surface and underground drains, etc.

(*D.*) Detailed descriptions of the villages are given, with particular reference to their adaptability to various methods of disposal of the organic wastes from the dwellings and outbuildings of the inhabitants.

(*E.*) Then follows a short statement of general sources of pollution, such as manured fields, roads and streets, plant growth in reservoirs and streams.

(*F.*) A large number of photographs of various sources of pollution were taken, and another series of views shows the character of the bed and banks of the proposed Quaker Bridge reservoir. Many of these are reproduced in Plates V to LXIX. A detailed description of all, whether reproduced or not, is given in the list of Descriptions of Photographs.

III. A discussion of the condition of the Croton water, chemically considered, for a series of years, with tables showing the results of analyses at various times. This discussion is furnished by Professor Elwyn Waller, Ph. D., of Columbia College, who has made many of the analyses, some of which are here published for the first time. Plate LXX gives graphical representations of some of the results.

IV. General descriptions of several methods of systematically disposing of the organic wastes from villages and hamlets show, with the descriptions of the villages, the adaptability of any of the various systems that may be suggested to individual cases.

Acknowledgments for assistance, which has always been cheerfully rendered, are due to the Aqueduct Commission, especially to the former chief engineer, Mr. B. S. Church, C. E.; to the Department of Public Works; to the Department of Public Health of New York city, and to the chief engineers of the New York Central and Hudson River rail-

road and the New York and Northern railroad. Much credit should likewise be given to Professor A. E. Phillips, of Purdue University, for his excellent photographic work and the preparation of maps and sketches. The artistic and accurate work of Mr. F. P. Burt in reproducing the photographs for publication, is deserving of much praise.

I wish, especially, to acknowledge my indebtedness to Mr. Emil Kuichling, C. E., the consulting engineer, for the very great amount of assistance he has rendered me in my preparation for writing this report and in getting it in proper form. His assistance has been invaluable. The fourth division of the report, especially, is largely due to his advice and direction.

I. GENERAL DESCRIPTION OF CROTON WATER-SHED.

The Croton river rises in the southern part of Dutchess county, New York, at a distance of about sixty-eight miles from the lower end of New York city. There are three main branches, called the East, Middle and West branches, which flow southward across Putnam county, joining to form the Croton river near its southern boundary, and flowing thence in a general southwesterly direction to the Hudson, which is entered at Croton Point, about thirty-five miles north of the lower end of New York city. Practically the entire water-shed of the river is above the site of the proposed Quaker Bridge dam. Its extent is about thirty-three miles north and south, with an average width of about eleven miles, making in all about 361 square miles from which water may be gathered for the supply of the city. Three hundred and thirty-eight square miles of the water-shed is above the Croton dam, and furnishes water to the present supply. Most of the water-shed lies in the State of New York, only a small proportion extending into the State of Connecticut on the east.

The geological formation is that of the primordial division, according to the system of the New York Geological Survey. The rocks are metamorphic in character, consisting principally of gneiss. There are a few strata of limestone, ranging in composition between pure carbonate of lime and dolomite, and some strata of micaceous and talcose slates. Some veins of granite, serpentine and iron ores are found. The strata dip generally to the east and at a large angle (from 30° to 90°), but there are numerous local exceptions to this rule. The principal localities at which limestone crops out are near Pine's Bridge, just west of Katonah, on Plum brook near Somers, near Purdys, at intervals between Purdys and North Salem, at Bedford village, near Cross pond, and in two places west of Peach lake, in Westchester county; south of Carmel, near Tilly Foster Mines, and from Pawling to three or four miles south of Patterson, in Putnam and Dutchess counties. The principal localities at which iron is found are in the hill just west of the East branch of Croton river between Brewster and Croton Falls (Theall mines) at Tilly Foster on the Middle branch reservoir, and at Mahopac Mines, northwest of Lake Mahopac, at which places magnetic iron ore is mined. There are indications of hematite near the Putnam county poor-house, west of Carmel, and greater or less amounts of "sulphate of alumina and iron" and of pyrites are found near the Theall mines, also near Ludingtonville, Dean's pond, Pine pond, Boyd's Corners reservoir, and at several places along the road west from Patterson for three or four miles. There are probably one or two places in the northwestern part of the water-shed where arsenical compounds may be found, but the iron mines are reported to be free from such impurities, and there can be no appreciable amount of them communicated to the water from any source since arsenic is not found in making chemical analyses of the water as delivered to the city.

The surface soil is generally very porous in character, containing sand or gravel in large proportions. There is but little clay on or immediately under the surface, though clay and "hard-pan" are found in some places at greater or less depths below the surface. There are but few drift deposits on the water-shed, and the river beds not on or through such deposits, appear to be generally of solid rock or of gravelly deposits upon solid rock. There are, however, several deposits of peat and peat-like material on the water-shed. The principal ones in extent are about fifty acres at Yorktown railroad station, draining partly into Muscoot river and partly by a brook running south, directly into Croton lake; about sixty acres, one-fourth mile west of Bedford village, draining through Davis brook; about 150 acres nearly three miles east of Golden's Bridge, draining by a brook running west into Croton river; about 500 acres along the East branch of Croton river near Patterson; about twenty acres draining by Beaver brook into Middle Branch of Croton river; about thirty acres near the east side of Lake Mahopac, draining by Broad brook into the West Branch of Croton river. There are numerous smaller deposits along the course of brooks which amount, in the aggregate, to a considerable quantity, sufficient, with the deposits mentioned above, to give a decided peaty tinge to the water of several streams, notably Cross river, Muscoot river, Titicus river, the upper portion of East Branch of Croton river, and part of West Branch of Croton river. Many swamps were observed, which are not of a peaty nature, and are usually of small extent. The total area of peaty soil on the water-shed may be roughly estimated at two square miles, or one one-hundred-and-eightieth of the total area. The amount of water flowing through such swamps may be very roughly estimated at fifteen per cent of the total drainage from the water-shed. This list

gives all the possible sources of contamination of the water supply from natural causes that we have been able to determine. With the exception of the contamination from peat and from the ordinary vegetation on the surface and in the streams, there is practically no natural source of pollution worth considering, and the water may therefore be regarded as being originally of excellent character.

The following tables, which are copied from the Report of the Aqueduct Commissioners, 1883-1887, will give the rainfall and the flow of the Croton river for each month in each year from January 1, 1870, to December 31, 1886.

The record of rainfall for Boyd's Corners, given in Table I, was chosen from several obtained on the water-shed, as giving on the whole the best average result for the amount of rainfall. (See report of Chief Engineer B. S. Church, page 50 of Aqueduct Commissioners' Report.) The tables were prepared from data furnished by the department of public works. The area of water-shed is taken at 338 square miles. (See Table 1 of above-mentioned report.)

Two columns are added to each of Tables I and II, as the report goes to press, giving the rainfall and discharge of the river for the years 1887 and 1888. I am indebted to Mr. G. W. Birdsall, chief engineer of the Croton aqueduct, for these figures.

TABLE I — Rainfall in Croton Basin.

Record of rainfall at Boyd's Corners, in Croton Basin, for each month from 1870 to 1888, inclusive.

MONTH.	In Inches of Depth.									
	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.
January	4.51	3.80	1.44	5.66	6.96	2.74	1.42	2.68	4.49	2.52
February	6.40	3.81	1.22	3.09	2.78	3.47	4.91	0.80	3.65	2.85
March	3.80	4.27	2.59	3.08	1.57	4.99	6.33	7.66	3.10	4.96
April	5.45	3.01	3.04	3.77	6.31	3.04	4.43	2.35	2.85	5.10
May	2.30	3.45	3.69	2.91	1.99	1.08	3.99	0.85	4.97	2.45
June	2.06	5.73	4.00	0.71	3.57	3.02	2.52	4.95	4.65	5.29
July	3.43	5.07	4.34	2.21	5.98	3.10	3.42	4.65	4.28	5.95
August	5.10	5.24	5.99	5.73	2.75	10.33	1.20	2.54	2.66	5.83
September	2.85	1.44	3.69	3.73	3.56	2.11	5.21	1.49	6.61	3.43
October	4.73	6.18	2.15	5.13	2.40	3.61	1.50	8.38	3.78	0.95
November	2.51	4.35	4.91	3.72	2.72	4.61	3.40	8.16	4.36	2.49
December	1.49	2.59	3.68	4.13	1.78	1.56	2.35	1.52	8.74	4.26
Totals	44.63	48.94	40.74	43.87	42.37	43.66	40.68	46.03	54.14	46.08
Flow of river (inches)	21.38	21.19	19.19	27.88	26.85	27.67	24.89	22.23	28.86	22.87
Flow of river (per ct.)	48	43	47	64	63	63	61	48	53	50

TABLE I.— (*Concluded*).

MONTH.	In Inches of Depth.								
	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.
January	4.00	4.19	4.41	2.80	5.07	5.59	5.24	5.68	5.56
February	2.92	5.28	5.96	5.21	6.31	4.66	5.20	6.01	5.37
March	4.51	6.14	4.58	1.67	4.82	1.29	3.86	3.60	6.44
April	3.99	1.67	1.36	3.94	2.96	2.09	3.61	3.47	2.68
May	1.17	3.74	6.30	2.86	4.33	2.44	4.54	0.32	6.27
June	1.28	5.72	3.04	5.64	2.04	1.19	3.09	7.65	2.00
July	5.65	2.45	3.63	4.26	6.54	5.27	4.40	13.32	2.43
August	3.60	1.71	3.92	2.09	4.50	7.35	3.21	7.06	6.87
September	2.69	0.75	14.33	2.45	1.69	1.09	2.30	2.00	10.77
October	3.25	3.65	3.33	6.99	3.74	5.19	2.28	3.12	4.80
November	2.97	4.50	1.66	1.79	4.37	5.99	5.57	2.69	4.49
December	2.49	6.53	2.68	3.45	7.34	3.84	4.29	6.71	6.13
Totals	38.52	46.33	55.20	43.15	53.71	45.99	47.59	61.63	63.51
Flow of river (inches)	15.32	20.16	25.35	15.95	25.41	19.48	22.24	28.38	37.81
Flow of river (per cent)	40	44	46	37	47	42	47	46	59

TABLE II—Supply from Croton River.

Record of the Monthly and Yearly Flow of Croton River at Croton Dam, including delivery through Aqueduct.

MONTH.	Flow Given in Thousand Gallons.									
	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.
January	23,443,112	3,490,092	12,222,554	25,190,678	48,233,413	3,829,362	9,334,517	4,929,879	16,718,571	8,528,727
February.............	25,114.023	12,948,748	7,342,248	10,107,045	16,423,478	24,021,091	21,430,226	9,099,799	23,011,109	16,256,316
March...............	20,827,788	20,647,985	10,253,261	23,635,801	17,767,268	18,997,996	42,012,668	40,941,937	22,852,341	25,259,331
April................	24,083,306	11,844,838	18,261,373	41,798,624	21,273,357	32,761,827	37,495,860	17,745,788	9,921,705	30,064,123
May	10,886,295	12,090,147	7,534,678	12,849,677	18,720,973	10,937,373	11,937,176	5,224,235	9,237,455	10,395,919
June.................	4,871,133	8,408,050	7,162,623	3,197,225	5,425,052	3,439,397	4,154,483	3,660,092	8,923,763	5,504,542
July	3,010,861	4,293,033	3,611,543	2,889,066	8,415,913	3,412,919	3,235,987	3,009,347	4,358,140	4,269,166
August...............	2,980,863	5,008,443	9,654,123	4,182,822	5,224,404	34,056,066	2,951,115	2,890,978	4,004,529	8,717,150
September...........	2,082,035	3,694,379	7,342,587	3,030.770	3,430,866	5,293,080	2,186,289	1,985,537	12,489,946	6,414,543
October	2,471,952	11,297,344	6,610,505	8,488,210	4,764,113	5,003,422	2,232,043	6,674,311	5,452,448	3,928,103
November	3,650,334	19,995,296	15,675,830	10,641,730	4,319,568	12,038,684	4,168,470	24,531,901	12,268,193	4,806,190
December..	3,776,523	12,363,397	8.507,810	19,829.430	5,741,227	10,797,288	6,967,995	11,551,011	42,438,458	11,884,505
Total.............	127,198,225	126,081,752	114,179,135	165,841,078	159,739,632	164,588,505	148,106,829	132,244,815	171,676,658	136,028.615
Monthly average	10,599,852	10,506,812	9,514,928	13,820,090	13,311,636	13,715,709	12,342,236	11,020,401	14,306,388	11,335,718

TABLE II — (*Concluded*).

MONTH.	Flow Given in Thousand Gallons. 1880.	1881.	1882.	1883.	1884.	1885.	1886.	Average for each month for years 1870 to 1886.	1887.	1888.
January	16,141,352	4,456,673	14,099,602	6,229,919	12,554,962	24,181,775	20,055,684	14,920,051	16,090,000	23,568,000
February	17,539,084	25,376,239	24,833,428	22,334,130	29,031,364	14,285,040	28,720,181	19,286,679	29,452,000	29,312,000
March	17,691,562	35,725,324	27,831,830	17,758,395	29,428,218	12,033,413	14,663,002	23,431,066	19,523,000	27,226,000
April	12,235,800	11,028,455	8,377,544	15,991,808	17,616,844	15,387,360	26,492,322	20,728,290	19,318,000	25,798,000
May	5,762,373	8,135,303	12,920,132	8,119,522	11,196,200	9,250,074	12,616,791	10,459,666	7,570,000	15,693,000
June	3,074,081	9,777,887	10,006,427	3,707,040	4,085,984	3,471,667	4,594,254	5,497,865	6,976,000	8,174,000
July	3,167,133	3,387,097	4,063,793	3,075,871	4,775,887	3,053,128	3,567,422	3,858,607	15,526,000	3,310,000
August	3,029,485	3,066,484	3,071,712	3,068,536	6,927,856	3,383,140	3,421,357	6,214,063	17,903,000	6,505,000
September	2,937,333	2,969,934	19,102,410	2,982,527	4,328,296	2,477,775	2,971,248	5,042,327	5,406,000	18,400,000
October	3,007,715	3,067,477	13,342,282	3,849,673	3,318,803	3,246,379	3,067,388	5,283,657	6,059,000	15,183,000
November	3,376,359	2,790,469	5,639,618	4,027,809	5,752,735	12,881,197	5,149,317	8,924,335	5,574,000	19,994,000
December	3,155,146	10,145,303	7,544,863	3,731,363	22,163,758	12,252,454	6,975,607	11,754,479	18,429,000	31,790,000
Total	91,117,423	119,926,645	150,833,641	94,876,593	151,180,907	115,903,402	132,294,573	135,401,085	167,826,000	224,943,000
Monthly average	7,593,118	9,993,887	12,569,470	7,906,383	12,598,409	9,658,617	11,024,548	....	13,985,500	18,745,250

N. B.— This flow of river includes storage drawn.

II. RESULTS OF INSPECTIONS OF WATER-SHED.

Two independent inspections of the Croton water-shed have been made, the first in 1884–5, under the direction of the health department of the city of New York, and the second in 1888, under the direction of the State Board of Health. The inspections were made upon different plans, as may be seen by a comparison of subhead A of this division of the report, which gives the results of the first inspection, with subheads B to F, which give the results of the second inspection. The first gives details of distance in feet and elevation with regard to water-courses, and of numbers of farm animals, including only such buildings as require special attention. It does not cover the entire water-shed, as may be seen by following the numbers of the items of Table III as they appear on the map, Plate I. But two regions of much importance were omitted, and these have probably assumed their present importance largely since that report was made. The second inspection covered, practically, every building in the water-shed, and while not entering into the same details as the first report, gives others of as great importance, presenting the details of distance and elevation largely by means of the maps, Plates I to IV; the details of number of buildings draining into each water-course, and requiring special attention, in Table IV; the details of villages and of many principal sources of pollution in the descriptions of villages and of photographs, which are accompanied by reproductions of many of the photographs, in Plates V to LXIX.

The sources of pollution from inorganic matter, due to mining and manufacturing operations, are few. They are comprised in the iron mines mentioned in Division I, whose drainage, when pumped to the surface, runs into the nearest streams, and a few factories, such as the lens factories

at Katonah and Mt. Kisco, a few carriage, wagon and blacksmith shops near or upon the banks of streams. The inorganic matter derived from leaching of the original soil, road detritus, and ultimate products of organic substances need not be specifically considered.

The artificial pollution from organic matter has been found to come: (1.) from factories; (2.) from villages; (3.) from farmhouses and their adjuncts; (4.) from manured fields; (5.) from roads; (6.) from vegetation in reservoirs. The following sections present details regarding these various sources:

A. Inspection by New York City Health Department.

The following, Table III, presents the results of the inspection in December, 1884, and January, 1885, under the direction of the city health department, as condensed and tabulated from the report of Mr. Alfred Lucas, inspector, to Cyrus Edson, M. D., chief inspector of the New York city health department, under date of March 30, 1885, of an inspection of the Croton river and its tributaries. The numbers designating the different items in the table have been transferred to the maps hereto appended (Plates I to IV), and thus show the location of each inspection.

The following is a description of the table and an explanation of the abbreviations used:

In the first column the number of each item is given. These numbers, found on the map, Plate I, give the location of each house inspected, with reference to the streams. One number sometimes covers an entire village.

In the second column ph stands for private house; sd for small dwelling; fh for farm house; l for large; d for dwelling; bs for blacksmith shop; m for mill or factory of any kind; c for church; g for cemetery; st for store; sh for schoolhouse. It is intended in this column to indicate the character of the principal building from which the pollution comes.

In the third column b stands for barn, which term often includes all the barns connected with the house; bs stands for barns; by for barn-yard; pv for privy vault; s for stable; pp for pig-pen; bp for barley pit. With but four or five exceptions there is a privy of some sort connected with each house, so that the term pv has been omitted wherever the space in the column was filled by other items. It is intended in this column to indicate the character of the outbuildings connected with the main buildings mentioned in the second column.

In the fourth column h stands for high; vh for very high; s for slight. Some idea is thus given of the relative elevations of buildings above the main streams into which they drain.

In the fifth column is given an estimate of the distance of the buildings from the stream into which they drain.

In the sixth column is given the number of cows.

In the seventh column is given the number of horses.

In the eighth column is given the number of pigs.

In the ninth column is given the name of the owner of the premises at the time the inspection was made.

In the tenth column is given the name of the town in which the premises are situated.

In the eleventh column are given such miscellaneous items of information as do not come under the above classification. The abbreviations are the same as in the third column.

The items are arranged in groups with reference to the main stream into which the buildings drain. The distances given in the fifth column are sometimes the distances of buildings from this main stream, and sometimes from tributaries to that stream, as indicated in the fifth column. All buildings in each group of items under the name of a main stream drain directly or indirectly into that stream, all drain-

age finally reaching the Croton river. A summary of each group is given in the general summary at the end of the table.

During the spring freshets the rivers overflow their banks from four to fifteen feet, and all privy vaults within that range are overflowed and washed out. Vaults within this distance are marked with a star (*).

A number of the items were singled out for special attention and description in a supplementary list of the report. These items have been marked in the table with a dagger (†) and their descriptions have been inserted in their proper places.

TABLE III — Inspection of Croton Water-shed — City Health Department.

Croton River, *December* 4, 1884.

Number.	Houses.	Outbuildings.	Elevation.	Distance.	Cows.	Horses.	Pigs.	Owner.	Town.	Remarks.
1	ph	b by	h	75 feet from Croton river..	10	2	....	A. Marshall	Yorktown....	
2	sd	pv	vh	300 feet from Croton river..	....	....	....	....	Yorktown....	
3	sd	pv	h	300 feet from Croton river..	....	....	....	....	Yorktown....	
4	fh	b by	s	100 feet from Croton river..	1	1	....	George Hyde..........	Yorktown....	Small brook through premises.
5	fh	b by	h	200 feet from Croton river..	10	2	....	S. Dickerman..........	Yorktown....	Barn on opposite side of road from house,
6	12 ph 2 fh	bs bys		On bank of Croton river....	....	....	....	....	Yorktown....	Village of Pines Bridge. Surface drainage into river.
7	fh	b by	s	100 feet from Croton river..	13	2	....	....	Yorktown....	
8	fh	b by	s	400 feet from Croton river..	25	3	....	....	Somers	
9	fh	pv	s	100 feet from Croton river..	....	....	....	....	Somers	
10	lfh	b by	h	100 feet from Croton river..	25	....	....	....	Somers	
11	ph	pv	....	50 feet from Croton river..	....	....	....	....	Newcastle ...	Level with river.
12	fh	b by	s	300 feet from Croton river..	12	2	....	....	Newcastle ...	
13	fh	b by	s	50 feet from Croton river..	10	1	....	....	Somers	
14	fh	b by	s	50 feet from Croton river..	15	....	....	....	Somers	Small brook through premises.
15	fh	b by	s	50 feet from Croton river..	10	....	....	....	Somers	
16	fh	b by	vh	400 feet from Croton river..	50	....	....	Mr. Nelson	Somers	Barn on opposite side of road from house.
17	fh	b by	h	500 feet from Croton river..	22	....	....	....	Somers	
18	fh	b by	h	300 feet from Croton river..	15	3	....	....	Somers	
19	fh	b by	vh	500 feet from Croton river..	30	....	....	....	Somers	Brook and small pond on premises discharge into Croton river.
20½	....	b by	s	On sm. br'k run. in. Cro. riv.	40	....	....	....	Somers	
21	4 ph	......	s	50 feet from Croton river..	....	....	....	....	Lewisboro...	Woodsbridge.

December 9, 1884.

Number.	Houses.	Outbuildings.	Elevation.	Distance.	Cows.	Horses.	Pigs.	Owner.	Town.	Remarks.
53	fh	b by	s	¼ mile from Croton river..	32	5	....	Geo. E. Todd..........	Lewisboro...	Small brook runs through premises and discharges into Croton.
54	sd	pv	s	¼ mile from Croton river..	....	....	....	Now gone................	Lewisboro...	
55	fh	b by	h	600 feet from Croton river..	35	4	4	A. H. Todd	Lewisboro...	
56	fh	b by	h	600 feet from Croton river..	25	4	3	W. Light................	Lewisboro...	
57	fh	b by	h	500 feet from Croton river..	....	....	....	Lewis Travis..........	Lewisboro...	Small brook runs through premises and discharges into Croton.
†58	lfh	b by	h	300 feet from Croton river..	28	2	....	W. R. Strong	Lewisboro...	Small brook runs within ten feet of, and drains barn-yard and discharges into Croton.

†59	fh	b by	h	100 feet from Croton river..	35	2	....	N. Merritt	Lewisboro...	Barn and barn-yard on opposite side of road from house. Small drain drains barn-yard into Croton.
60	d	b pv	h	100 feet from Croton river..	....	...	....	L. Ferguson.....	Lewisboro...	
61	sd	pv	h	150 feet from Croton river..	....	....	....	N. Merritt	Lewisboro...	
†62	fh	b by	h	200 feet from Croton river..	6	2	3	E. Agor......	Lewisboro...	Small drain runs through and drains barn-yard into Croton.
63	......	......	h	¼ mile from Croton river ..	....	....	....	....	Lewisboro...	Goldens Bridge: population 100; small brook runs through village and discharges into Croton; surface drainage into brook: pv's from five to twenty-five feet of bank. See sketch of Goldens Bridge, Plate III.
	†bs	pv	....	Over brook.................	....	....	....	Mrs. McCue	....	
	......	†s pp	....	Over Croton river..........	...	2	3	George Todd...........	....	
	†d	pv	s	300 ft. from Croton river. Pv. 10 ft. from Croton r..	....	....	....	George Brown	....	
	....	†b by bp	s	350 feet from Croton river..	60	....	....	E. B. Brady	....	
†64	fh	b by	h	One mile from Croton river.	35	2	10	N. Merritt...............	Lewisboro...	Small brook runs through and drains barn-yard into Croton; barn and barn-yard on opp. side of road from house.
65	fh	b by	h	Two miles from Croton riv.	40	10	15	E. B. Brady.............	Lewisboro...	Cider mill on small brook running into Croton: refuse used for manure.
66	fh	b by	h	50 ft. from brook running into Croton.............	20	3	3	Martin Todd	Lewisboro...	
67	d	b pv	h	75 ft. from brook running into Croton.............	1	....	2	J. Reynolds.............	Lewisboro...	
68	fh	b by	h	100 feet from Croton river..	20	4	3	George Mead...........	Somers	
†69	fh	b by	h	600 feet from Croton river..	15	3	6	Wm. Parker............	Lewisboro...	Small drain drains pig pen and carriage house, on opp. side of road, into river.
70	sd	b pv	h	100 feet from brook running into Croton........	....	....	....	Mrs. Sherwood..........	North Salem.	
*71	sd	pv	s	50 feet from brook running into Croton........	....	....	....	Lew. Horton.....	North Salem.	Privy ten feet from brook.
72	fh	b by	h	150 feet from brook running into Croton........	20	3	4	Lew. Horton....	North Salem.	One-quarter mile from river.
73	lfh	b by	h	50 feet from brook running into Croton........	30	40	4	Sam. Mead	North Salem,	One-quarter mile from river.
†74	fh	b by	h	150 feet from Croton river..	20	2	3	Charles Adams..........	North Salem.	Small drain from barn-yard.
75	d	b by	h	150 feet from Croton river..	....	....	....	N. Mead.................	North Salem.	
76	fh	b pv	h	150 feet from Croton river..	15	2	3	Mrs. Quirk..............	North Salem.	
77	d	pv	h	100 feet from Croton river..	....	....	....	F. Frost.................	North Salem.	
†78	fh	b by	h	100 feet from Croton river..	20	3	3	F. Frost.................	North Salem.	Barn-yard on opposite side of road from house; small brook, twenty-five feet from privy, drains the barn-yard and empties into river; twenty sheep.
†79	......	......	s	200 feet from Croton river..	....	....	....	....	North Salem.	Purdys: population 200; fifty feet from Titicus river; privies twenty-five to fifty feet from Titicus; surface drainage runs into both rivers. See sketch of Purdys, Plate III.
79	†m	pv s	....	....	....	....	....	Am. Cond. Milk Co......	....	Condensed milk factory on bank of Titicus; privy also; stables twenty feet; refuse from condenser and water used in cleaning cans discharged into river.

TABLE III — Croton River — (*Continued*).

Number.	Houses.	Outbuildings.	Elevation.	Distance.	Cows.	Horses.	Pigs.	Owner.	Town.	Remarks.
79	*d	pv.	s	10 feet from Titicus river..	....	....	....	J. Gandle................	....	
79	*d	pv.	s	15 feet from Titicus river..	....	....	....	R. Gandle......	....	
79	m	......	....	On bank of Titicus river..	....	....	....	H. Purdy.................	....	Saw and grist-mill.
80	d	pv	s	25 feet from Croton river ..	....	....	....	E. Brady.................	Somers	
†81	fh	b by	h	150 feet from Croton river..	40	4	3	E. Brady.................	Somers	Small brook drains barn-yard into river.
				December 10, 1884.						
99	s fh	b by	s	50 feet from brook running into Croton.......	2	....	1	S. Hynard	North Salem.	
100	fh	b by	s	75 feet from brook running into Croton.......	6	2	....	R. Sarles................	North Salem.	
101	fh	b by	s	50 feet from brook running into Croton.	5	1	2	J. Smith	North Salem.	Privy ten feet from brook.
				December 12, 1884.						
171	fh	b by	h	300 feet from Croton river..	30	2	5	C. McBride	North Salem.	Small brook drains premises into river.
172	sd	b	s	50 feet from Croton river..	....	....	....	Mrs. Carey	North Salem.	
173	fh	b by	h	200 feet from Croton river..	20	2	5	C. Wallace...............	North Salem.	
174	fh	b by	h	700 feet from Croton river..	25	3	4	J. Purdy...	North Salem.	Barn fifty feet from brook.
175	fh	b by	s	800 feet from Croton river..	4	1	2	Major Bailey............	North Salem.	Fifty feet from brook.
176	fh	b by	vh	¼ mile from Croton river..	20	2	3	E. D. Butler.......	North Salem.	One hundred feet from brook.
†177	sd	pv	s	¼ mile from Croton river..	....	....	....	E. D. Butler	North Salem.	Fifty feet from brook; privy over brook.
178	c g	......	vh	200 feet from Croton river..	...	....	....	....	North Salem.	Roman Catholic church.
179	......	......	s	100 feet from Croton river..	....	...	....	....	North Salem.	Croton Falls; population 300; surface drainage into river; privies twenty-five to 150 feet from river. Sketch, Plate III.
179	m	pvs	....	On bank of Croton river ..	....	....	....	J. Purdy	....	Machine shop.

Cross River — *December 4, 1884.*

22	20 h	......	s	On banks of Cross river...	....	....	....	....	Bedford & Lewisboro.	Whitlockville; population 100; 600 feet from Croton river; privies twenty-five to seventy-five feet from river. See sketch of Katonah, Plate II.
......	†m	......	....	On banks of Cross river...	....	....	....	American Lens Co	....	Water-closet discharges into hogshead under bed of raceway; probably used as urinal only.

December 5, 1884.

23	......	......	s	200 feet from Cross river ..	....	....	....	....	Bedford & Lewisboro.	Katonah; population, 400; surface drainage runs into river; ten privies within fifty feet of river. See sketch of Katonah, Plate II, for 23, 24 and 25.
†24	......	......	....	Drain from vil'ge into riv'r	....	....	....	E.B. Newman, Travis building	Bedford	Drain originally comes from swamp back of village, and up to 300 feet of its mouth is entirely open; smell from sewage discharged is very offensive.
†25	sh	......	h	On bank of Cross river....	....	....	10	A. M. VanTassel	Bedford	Slaughter house: about three cattle a week: refuse given to pigs; kept in vat, overflowing into river.
26	h	pv	....	On sm'l b'k r'g into Cross r.	....	....	....	....	Bedford	
27	d	pv	....	On Cross river	....	....	....	....	Bedford	Also grist mill: privy twenty-five feet from river.
28	d	b by	h	On sm'l b'k r'g into Cross r.	10	10	....	G. Green...............	Bedford	
29	fh	b by	vh	¼ mile from Cross river...	18	2	6	I. H. Haight............	Bedford	
30	d	b by	vh	¼ mile from Cross river...	...	....	....	W. Haight..............	Bedford	Small pond and brook runs through premises to river.
31	fh	b by	vh	¼ mile from Cross river...	....	40	....	F. Brans	Bedford	Steams feed for cows.
*32	2 sd	2 pvs	s	On brook running into Cross river	....	....	....	Staples & Avery........	Lewisboro...	Privies ten feet from brook. See sketch of Cross River, Plate II.
33	......	......	s	On banks of Cross river...	....	....	....	....	Lewisboro...	Cross River; population 180; surface drainage into river; feed, saw and cider mills; cemetery on high hill, 200 feet from river; 350 people buried. See sketch, Plate II.
34	h	b by	h	200 ft. from Lake Waccabuc.	....	....	....	....	Lewisboro...	Waccabuc house; 200 guests; summer hotel.
*35	h	pv	...	On Lake Waccabuc........	....	...	....	....	Lewisboro...	Boat house; family; privy ten feet from lake.
36	fh	b by	s	100 ft. from Waccabuc river.	....	....	....	....	Lewisboro...	Privy on level with river.
37	fh	b by	s	500 ft. from Waccabuc river.	....	....	....	J. Lawrence	Lewisboro...	
38	fh	b by	s	500 ft. from Waccabuc river.	....	....	...	E. Lawrence	Lewisboro...	Brook drains barn yard into river.
†39	8 h	......	s	On Cross river	....	....	....	....	Lewisb'o & Poundri'ge	Boutonville; population, thirty; two privies on bank of brook; other privies ten to twenty feet from river; surface drainage into river,
40	d	b	s	50 ft. from b'k into Cross r.	....	....	....	....	Lewisboro...	

TABLE III — Beaver Dam Brook — (*Continued*).

January 13, 1885.

Number.	Houses.	Outbuildings.	Elevation.	Distance.	Cows.	Horses.	Pigs.	Owner.	Town.	Remarks.
753	fh	b by	h	100 ft. from br. Beav. D. b'k.	6	3	2	D. Haight	Bedford	
754	fh	b by	vh	250 ft. from br. Beav. D. b'k.	3	2	3	C. L. Birdsall	Bedford	
755	fh	b by	h	100 f. f'm b'k r. into br. B. D. b.	15	3	2	J. Holmes	Bedford	
756	fh	b by	h	75 ft. f'm b'k r. into Bea. D. b.	15	2	....	W. Knowlton	Bedford	
757	d	b by	h	30 ft. f'm b'k r. into Bea. D. b.	1	1	....	J. Anderson	Bedford	
758	fh	b by	s	100 ft. f'm b'k r. into br. B. D. b	10	2	3	A. Fowler	Bedford	
759	fh	b by	h	300 ft. f'm br'ch Beav. D. b'k.	....	....	....	Estate of W. Howe	Bedford	100 feet from small brook.
760	......	......	h	350 ft. f'm br'ch Beav. D. b'k.	....	....	....	......	Bedford	Bedford Station, pop. 150. Surface drainage into brook. (See sketch of Bedford Station, plate II.)
......	......	s	....	5 feet from brook	....	2	....	Geo. Small	......	
......	3d	pvs	h	50 feet from brook	....	....	....	Burt, Geslein, Barrett	......	
......	d	b	s	25 feet from brook	....	....	....	J. Dick	......	Barn ten feet from brook.
......	st	pv	s	150 feet from brook	....	....	....	W. C. Reynolds	......	
......	d	pv	s	150 feet from brook	....	....	....	A. Lockwood	......	
......	bs	pv	s	150 feet from brook	....	....	....	H. Birdsell	......	
†761	fh	b by	h	100 ft. f'm branch Beav. D. b.	15	2	3	Mr. Lowenstein	Bedford	Small drain from barn-yard into brook.
*762	sd	pv	....	10 ft. f'm branch Beav. D. b	....	....	....	Mr. Lowenstein	Bedford	
763	3sd	pvs	h	75 ft. f'm branch Beav. D. b.	....	....	....	Kenney, McNally, Trac'y	Bedford	
764	d	pv	h	100 ft. f'm bra'ch Beav. D. b.	....	....	....	C. Birdsell	Bedford	
765	d	pv	h	250 ft. f'm bra'ch Beav. D. b.	....	....	....	B. T. Babbitt	Bedford	
766	d	s	vh	700 ft. f'm bra'ch Beav. D. b.	....	35	...	B. T. Babbitt	Bedford	
767	d	pv	h	150 ft. from Beav. Dam b'k.	....	....	....	H. Wood	Bedford	
768	fh	b by	h	300 ft. from Beav. Dam b'k.	3	2	2	C. Briggs	Bedford	
769	fh	b by	vh	700 ft. from Beav. Dam b'k.	5	2	4	S. Lyon	Bedford	100 feet from small brook.
770	d.fh	b by	vh	1,200 ft. from Beav. Dam b'k.	....	....	....	J. Jay	Bedford	100 feet from small brook.
771	fh	b by	vh	1,000 ft. from Beav. Dam b'k.	15	7	....	H. E. Pellew	Bedford	
†772	fh	b by	s	100 feet from Broad brook	10	3	3	W. Lyon	Bedford	Barn and barn-yard on opposite side of road, ten feet from brook.
773	fh	b by	s	150 feet from Broad brook	6	1	4	A. Reed	Bedford	
774	fh	b by	s	150 feet from Broad brook	9	3	4	J. Cromwell	Bedford	
775	fh	b by	vh	1,000 ft. f'm br'ch Beav. d. b.	15	2	2	E. F. Brady	Bedford	
776	d	b	h	150 feet from Broad brook	....	1	....	W. L. Barrett	Bedford	
777	fh	b by	s	75 feet from Broad brook	13	2	1	W. Lounsbury	Bedford	
778	fh	b by	h	150 feet from Broad brook	13	2	3	W. Flewellyn	Bedford	
779	fh	b by	s	75 feet from Broad brook	6	1	2	Estate of P. Buxton	Bedford	Privy fifteen feet from brook.
780	d	b by	s	75 feet from Broad brook	....	5	4	S. Sutton	Bedford	Small drain from barn-yard into brook.

781	fh	b by	s	75 feet from Broad brook...	15	2	2	R. Nolan..................	Bedford	
782	fh	b by	s	75 feet from Broad brook...	25	3	2	S. Sutton..................	Bedford	
783	d	pv	h	300 feet from Broad brook...	....	....	....	R. Lounsbury	Bedford	
784	d	s	s	75 feet from Broad brook...	3	10	....	R. Lousbury.............	Bedford	
785	d	pv	h	4 feet from Broad brook....	....	....	....	R. Lounsbury...........	Bedford	
786	d	b	vh	300 feet from Broad brook..	....	....	....	J. Lounsbury............	Bedford	
787	d	b	vh	300 feet from Broad brook..	1	....	....	J. Lounsbury............	Bedford	Thirty feet from small brook.
788	d	pv	h	100 feet from small brook...	....	....	....	J. Lounsbury............	Bedford	
789	d	b	h	200 feet from Broad brook..	....	....	....	S. Hoyt....................	Bedford	
790	fh	b by	s	75 ft. from branch Broad bk	15	4	4	S. Hoyt....................	Bedford	
†791	fh	b by	s	100 feet from Broad brook	10	2	3	Mrs. Snyder.............	Bedford	Small drain runs from barn-yard into brook.
792	fh	b by	s	75 feet from Broad brook...	5	2	....	B. Sorrel..................	Bedford	Barn ten feet from brook.
793	d	pv	h	150 feet from Broad brook..	....	....	....	L. Searles................	Bedford	
794	d	pv	h	75 feet from Broad brook...	....	....	....	S. W. Reynolds.........	Bedford	

January 14, 1885.

795	fh	b by	h	100 feet from brook..........	6	2	1	Mrs. Lyons..............	Bedford	
796	d	pv	s	75 feet from brook..	....	....	....	Z. Brown	Bedford	
797	d	pv	h	150 ft. from BeaverDam b'k.	....	....	....	D. Miller.................	Bedford	
798	d	s pp	....	50 ft. from Beaver Dam b'k.	....	1	4	G. A. Matthews	Bedford	Grist-mill on bank.
799	d	b	h	100 ft. from Beaver Dam b'k.	1	1	2	W. Wescott.............	Bedford	Carriage factory also.
800	d	pv	h	100 ft. from Beaver Dam b'k.	....	....	....	J. Miller	Bedford	
801	d	b	s	100 ft. from Beaver Dam b'k.	1	1	....	E. Howe	Bedford	
802	d	b	h	75 ft. from Beaver Dam b'k.	...	1	....	E. J. Purdy..............	Bedford	
803	d	b	s	200 ft. from Beaver Dam b'k.	....	....	....	W. Munson..............	Bedford......	
804	d	b	s	50 feet from Davis brook...	....	....	....	M. Murphy	Bedford	Barn and privy ten feet from brook.
805	fh	b by	s	100 feet from Davis brook...	....	....	....	Mut. Life Ins. Co.......	Bedford	
806	d	pv	s	100 feet from Davis brook...	....	....	....	Mrs. Buckley............	Bedford	
807	d	pv	s	100 feet from brook..........	....	....	....	Mrs. Smith	Bedford	
808	d	pv	s	100 feet from Davis brook...	....	....	....	George Halsey..........	Bedford	
809	d	pv	s	100 feet from Davis brook...	...	....	....	W. H. Hague............	Bedford	
810	d	b by	.h	50 feet from small brook....	20	4	3	M. Clarke................	Bedford	
811	fh	b by	h	50 feet from brook...........	....	....	...	G. Raymond.............	Bedford	
812	sd	pv	h	25 feet from brook...........	....	....	....	M. Clarke................	Bedford	
†813	fh	b by	h	300 feet from Davis brook...	25	3	2	J. G. Clarke..............	Bedford	Small brook, three feet from privy, runs under barn-yard and into Davis brook.
814	sd	pv	s	75 ft. from Stone Hill river..	....	....	....	W. Woodcock............	Bedford	
815	sd	pv	h	75 ft. from Stone Hill river..	....	....	....	W. Woodcock............	Bedford	
816	fh	b by	h	50 ft. from Stone Hill river,.	2	....	2	G. K. Brown.............	Bedford	Barn and barn-yard fifteen feet from br'k.
817	fh	b by	s	150 ft. from Stone Hill river.	3	1	2	C. Brown	Bedford	
818	d	b	h	100 ft. from Stone Hill river.	....	....	....	A. Greene................	Bedford	
819	fh	b by	s	250 ft. from Stone Hill river.	12	2	2	Dr. Drummond	Bedford	
820	d	pv	s	150 ft. from Stone Hill river.	....	....	....	Dr. Drummond	Bedford	
821	fh	b by	s	400 ft. from Stone Hill river.	....	....	....	E. Luddington..........	Bedford	
822	fh	b by	s	Near Stone Hill river.......	36	4	....	M. Normeile............	Bedford	Small brook drains barn-yard.
823	fh	b by	s	300 ft. from Stone Hill river.	30	15	5	F. C. Williams..........	Bedford	

TABLE III — Beaver Dam Brook — (*Continued*).

Number.	Houses.	Outbuildings.	Elevation.	Distance.	Cows.	Horses.	Pigs.	Owner.	Town.	Remarks.
824	fh	b by	h	300 ft. from Stone Hill river,	15	3	2	I. Williams	Bedford	
†825	fh	b by	h	75 feet from Stone Hill river,	6	2	....	A. Halstead	Bedford	Privy ten feet from brook which drains barn-yard into river.
826	fh	b by	h	200 ft. from Stone Hill river,	25	3	....	B. Knapp	Bedford	
†827	fh	b by	h	200 ft. from Stone Hill river,	10	2	....	A. Taylor	Bedford	Drain from barn-yard into brook.
828	fh	b by	s	300 ft. from Stone Hill river,	8	2	....	L. Greene	Poundridge	
829	d	b	s	50 feet from brook	....	2	....	H. Barrett	Poundridge	
830	fh	b by	s	50 feet from brook	20	2	3	C. Barhart	Poundridge	
831	fh	b by	h	50 feet from brook	8	2	....	W. Barnes	Poundridge	
832	d	pv	h	50 ft. from br. Stone Hill riv.	....	....	....	J. Strange	Bedford	
				Muscoot River, *December* 4, 1884.						
40	m	.....	...	On bank of Muscoot river..	...	...	...	W. H. Nelson	Somers	Saw mill.
				***December* 6, 1884.**						
41	fh	b by	h	100 feet from brook	30	....	....	J. Parent	Somers	
*42	†sd	b	s	On bank of small brook...	....	....	....	Mr. Hoffman	Somers	
*43	†fh	b by	s	On bank of small brook....	15	....	5	G. Tillotson	Somers	Pig-pen, barnyard and privy on bank of brook.
44	h	......	s	50 feet from Muscoot river,	....	....	....	Catholic	Somers	Cesspool 25 feet from river, cemented and water-tight, ten feet wide and deep, cleaned every m'th, water-closets con'd.
†45	9 h	......	s	50 feet from Muscoot river,	....	...	....	Catholic	Somers	St. Joseph Institute, 20 pupils, 32 brothers, water-closets drain into cesspool 35 ft. from river, cemented and water-tight, ten feet deep and wide, cleaned every month. Contents of both above cess-pools spread on hills ¼ mile from river. Surface drains into river.
†46	fh	b by	h	500 feet from Muscoot river,	20	....	4	A. Nelson	Somers	Small drain from barn-yard into river.
†47	fh	b by	h	100 feet from Muscoot river,	6	....	4	C. Cook	Somers	Privy ten feet from brook draining barn-yard into river.
48	fh	b by	h	150 feet from Muscoot river,	15	....	3	E. Hynard	Somers	
49	3 h	......	s	150 feet from Muscoot river,	....	....	....	....	Somers and Yorktown,	Amawalk, grocery, dwelling, barns, small brook by barns.

†50	fh	b by	h	500 feet from Muscoot river,	15	....	3	J. Ferris	Yorktown....	
51	fh	b by	vh	100 feet from Muscoot river,	10	....	3	Mr. Hallock	Yorktown....	Drain from barn-yard to river.
*52	2 h	......	....	On bank of Muscoot river..	....	....	....	Rhodes & Peterson......	Yorktown....	Hallock's Mills, grist-mill, Mr. Tracey, owner, two houses on opposite side of river, privies ten feet from river.

December 11, 1884.

118	fh	b by	h	100 feet from Muscoot river,	20	2	4	W. Carpenter	Somers......	
119	fh	b by	h	50 feet from Muscoot river,	25	4	4	J. Barlow	Somers......	
120	fh	b by	s	50 feet from Muscoot river,	20	3	3	C. J. Tompkins	Somers......	Barn-yard and pig pen 25 feet from river.
121	fh	b by	s	150 feet from Muscoot river,	6	2	....	Mrs. Horton	Somers......	Barn-yard twenty-five feet from river.
122	sd	pv	h	25 feet from Muscoot river.	....	....	....	Mrs. Horton	Somers......	House twenty-five feet from small brook.
123	fh	b by	vh	300 feet from Muscoot river.	10	4	3	J. Burdell	Somers......	
124	sd	pv	vh	300 feet from Muscoot river.	....	....	....	J. Burdell	Somers......	
125	fh	b by	s	300 feet from Muscoot river.	25	2	3	Parent estate	Somers......	
126	fh	b by	h	200 feet from Muscoot river.	15	2	2	Mrs. Green	Somers......	
127	fh	b by	h	200 feet from Muscoot river.	3	1	2	J. Perry	Somers......	
128	m	pv	....	On bank of Muscoot river..	....	....	....	J. Halstead	Somers......	Grist-mill on bank of river.
129	fh	b by	h	200 feet from Muscoot river.	20	4	12	B. Lent	Somers......	Saw-mill; privy twenty feet from river.
130	fh	b by	h	300 feet from small brook..	20	3	8	H. G. Barrett	Somers......	
131	fh	b by	h	300 feet from Muscoot river.	15	2	3	Mrs. Purdy	Somers......	Slaughter three cattle a week.
132	sd	pv	h	300 feet from Muscoot river.	....	....	....	H. Light.	Somers......	
133	fh	b by	s	50 feet from Muscoot river..	20	4	8	A. Thorn	Somers......	
134	sd	pv	s	50 feet from Muscoot river..	....	....	....	A. Thorn	Somers......	
135	sd	pv	....	25 feet from Muscoot river..	....	....	....	A. Thorn	Somers......	
136	m	......	....	On bank of Muscoot river..	....	....	....	S. Blydenburgh	Somers......	Privy ten feet from river, level with bank.
137	d	pv	h	50 feet from Muscoot river..	....	....	....	A Thorn	Somers......	Saw and grist-mill.
138	fh	b by	h	300 feet from Muscoot river.	15	3	3	J. Griffin	Somers......	
139	d	pv	s	25 feet from small brook....	....	....	....	J. Connard	Somers......	
140	fh	b by	h	150 feet from brook	20	4	3	J. Connard	Carmel......	
141	fh	b by	h	100 feet from brook	25	5	6	H. Agor	Carmel......	
142	d	pv	....	On small brook	....	....	....	....	Carmel......	Privy twenty-five feet from brook.
†143	bs	......	....	On small brook	....	....	....	D. Fisher	Carmel......	Small brook runs under shop.
144	......	......	s	On Muscoot river.	....	....	....	....	Carmel......	Red Mills (Mahopac Falls); population, 100: surface drainage into river; privies ten feet from river, river walled up by four foot wall.
145	30h	......	vh	On Lake Mahopac	....	....	....	....	Carmel......	Lake Mahopac; population, 300; houses on three sides of lake, a few close to shore; cemented, water-tight cesspools.
†*	d	pv	....	On Lake Mahopac	....	....	....	H. Bergh	Carmel......	Lake washes into privy.
	d	pv	s	15 feet from Lake Mahopac.	....	....	....	J. A. Patterson	Carmel......	Privy fifteen feet from lake.
†146	d	b	....	In Lake Mahopac	....	2	....	T. R. Ganung	Carmel......	On Goode Island; privy kept full of ashes; cleaned twice a year.

Plum Brook — *December* 11, 1884.

147	d	pv	h	75 ft. from branch Plum br'k.	....	....	....	A. Dexter	Carmel......	
148	fh	b by	vh	50 ft. from branch Plum br'k.	8	2	2	D. Parent	Carmel......	

TABLE III — Plum Brook — (*Continued*).

Number.	Houses.	Outbuildings.	Elevation.	Distance.	Cows.	Horses.	Pigs.	Owner.	Town.	Remarks.
149	sd	pv	s	50 ft. from branch Plum br'k.	....	....	....	S. Dean..................	Carmel	
150	fh	b by	h	50 feet from Plum brook....	15	3	3	H. Merritt...............	Somers	
157	d	pv	h	50 feet from Plum brook....	....	....	3	George Ruxer...........	Somers	Pig pen; saw-mill on bank of brook.
158	fh	b by	h	50 feet from Plum brook ...	20	3	3	H. Hallock	Somers	Grist and saw-mill on opposite side of road on bank of brook,
159	6 sd	pvs	h	100 feet from Plum brook ..	....	....	....	....	Somers	
160	fh	b by	s	50 feet from Plum brook ...	20	4	3	H. Voorhees............	Somers	
161	fh	b by	s	200 feet from brook..........	30	4	6	T. Crane................	Somers	
162	fh	b by	h	200 ft. from b'nch Plum br'k	25	3	3	T. Jones................	Somers	Barn and barn-yard fifty feet from brook.
163	d	b	s	100 ft. from b'nch Plum br'k	....	2	....	F. Camp	Somers	Barn twenty-five feet from branch.
164	2 sd	pvs	h	100 ft. from b'nch Plum br'k	....	....	....	G. R. Kelly	Somers	Cider and saw-mill on bank.
165	fh	b by	vh	300 ft. from b'nch Plum br'k	34	4	5	G. R. Kelly	Somers	
166	fh	b by	h	250 ft. from b'nch Plum br'k	50	4	8	....	Somers	
167	fh	b by	h	250 ft. from b'nch Plum b'rk	30	2	4	G. A. Teed.............	Somers	
168	fh	b by	vh	200 ft. from Plum br'k.......	20	3	4	A. Ferris	Somers	
169	sd	pv	s	50 ft. from Plum br'k........	....	....	....	E. D. Brady	Somers	Privy ten feet from brook.
170	fh	b by	s	400 ft. from Plum br'k.......	40	4	4	E. D. Brady	Somers	

Titicus River — *December* 10, 1884.

Number.	Houses.	Outbuildings.	Elevation.	Distance.	Cows.	Horses.	Pigs.	Owner.	Town.	Remarks.
82	fh	b by	h	200 feet from Titicus river..	4	2	1	H. Slocom	North Salem.	
83	d	pv	h	150 feet from Titicus river..	....	....	....	S. Smith	North Salem.	
†84	fh	b by	h	200 feet from Titicus river..	4	2	3	C. Lobdell..............	North Salem.	Small brook drains premises.
85	fh	b by	h	150 feet from Titicus river..	6	1	3	M. Todd	North Salem.	Small brook fifty feet from barn and barn-yard.
86	fh	b by	h	400 feet from Titicus river..	12	1	3	N. F. Smith............	North Salem.	
87	sh	pv	h	250 feet from Titicus river..	....	....	....	....	North Salem.	School-house.
88	d	pv	s	25 feet from Titicus river ..	....	....	2	N. F. Smith............	North Salem.	Pig pen and privy three feet from river.
89	fh	b by	h	150 feet from Titicus river..	15	2	5	J. Slocom...............	North Salem.	
90	fh	b by	h	400 feet from Titicus river..	....	....	...	C. Bloomer	North Salem.	Barn and barn-yard on opposite side of road: house fifty feet from small brook.
91	fh	b by	h	400 feet from Titicus river..	25	3	5	F. T. Brown............	North Salem.	
92	fh	b by	h	400 feet from Titicus river..	3	1	2	A. Westcott	North Salem.	
93	fh	b by	h	100 feet from Titicus river..	30	3	6	Mrs. Bailey.............	North Salem.	
94	d	b by	....	50 feet from Titicus river ..	3	2	3	I. Wheeler..............	North Salem.	On level with bank.
†95	m	......	....	Over Titicus river	....	....	....	I. Wheeler..............	North Salem.	Woolen mill; workmen evacuate through hole in floor; fifteen to twenty hands.

*96	sd	pv	....	10 feet from Titicus river	....	....	....	I. Wheeler	North Salem.	On level with bank.
97	fh	b by	s	50 feet from Titicus river	....	....	2	M. Dwyer	North Salem.	
98	fh	b by	vh	400 feet from Titicus river	7	2	3	Mr. Perano	North Salem.	Barn one hundred feet from small brook.
†102	d	b by	h	200 feet from Titicus river	3	2	2	A. Reynolds	North Salem.	Blacksmith shop; small brook drains premises.
103	d	b by	h	150 feet from Titicus river	....	....	....	H. Reynolds	North Salem.	
104	fh	b by	h	150 feet from Titicus river	15	2	6	H. Reynolds	North Salem.	
†105	d	b by	h	On bank of Titicus river	140	....	....	T. W. Decker	North Salem.	Dairy; small brook drains barn-yard; urine from stables discharged into hogsheads which are emptied on farm; privy and manure pit ten feet from river; water used in cleaning milk-cans runs into brook.
106	d	b by	s	400 feet from Titicus river	40	12	....	T. W. Decker	North Salem.	Barn-yard twenty-five feet from small brook, cess-pool six feet deep, cemented and water-tight.
107	fh	b by	s	100 feet from Titicus river	15	2	2	....	North Salem.	Small brook through premises.
108	sd	pv	s	25 feet from Titicus river	....	....	....	T. L. Purdy	North Salem.	Privy on bank of river.
109	fh	b by	h	200 feet from Titicus river	25	2	3	H. Keeler	North Salem.	Barn on opposite side of road, fifty feet from small brook.
*110	25 h	......	h	On bank of Titicus river	....	....	....	....	North Salem.	Salem Center, population 150, privies ten to seventy-five feet from river. Cider, grist and saw-mill on bank. Surface drainage into river. See sketch of Salem Center, Plate III.
111	fh	b by	h	200 feet from Titicus river	10	1	3	G. C. Benedict	North Salem.	
112	fh	b by	h	50 feet from Titicus river	30	1	5	A. B. Mead	North Salem.	
113	h	pv	s	50 feet from Titicus river	....	....	....	A. B. Mead	North Salem.	Small hotel.
114	d	b	....	50 feet from Titicus river	....	....	....	R. C. Russell	North Salem.	Privy level with bank. Small brook drains premises.
115	d	b	....	50 feet from Titicus river	....	2	....	M. Spencer	North Salem.	Level with bank. Small brook drains premises.
116	......	......	h	50 to 100 ft. from Titicus riv.	....	....	....	....	North Salem.	North Salem, population 300, surface drainage into river. Several small brooks through different parts of village. See sketch of North Salem, Plate III. All privies within twenty-five feet of river are cemented, water-tight.
......	m	......	....	On bank of Titicus river	....	....	....	R. H. Storrs	North Salem.	Grist and cider mill. Privy twenty-five feet from river.
......	2 m	......	....	....	....	....	....	....	....	One blacksmith shop and one distillery in village.
......	d	......	....	150 feet from Titicus river	....	....	....	W. H. I. Howe	North Salem.	Water-closets discharge through drain into river.
......	d†	......	....	150 feet from Titicus river	....	....	....	C. Scott	North Salem.	Water-closets discharge through drain into river.
......	d†	pv	s	200 feet from Titicus river	....	....	....	I. Merritt	....	Privy built over brook.
......	d†*	pv	....	10 feet from Titicus river	....	....	....	S. B. Quick	North Salem.	Privy discharges into river.
......	2 d†*	s	s	10 feet from Titicus river	....	....	....	M. Tidd	North Salem.	
†117	fh	b by	h	....	25	2	4	Mr. Haines	North Salem.	Small brook drains barn-yard into river.

TABLE III — East Branch of Croton River — (*Continued*).

December 13, 1884.

Number.	Houses.	Outbuildings.	Elevation.	Distance.	Cows.	Horses.	Pigs.	Owner.	Town.	Remarks.
180	sd	pv	s	30 ft. from E. Branch Croton	....	....	....	Mr. Mattice	North Salem.	Privy ten feet from river.
181	sd	b	s	30 ft. from E. Branch Croton	....	2	...	J. Tompkins	North Salem.	Privy ten feet from river.
182	m	......	....	800 ft. from E. Branch Croton	....	....	....	J. Franz	North Salem.	Lager-beer bottling establishment on level with river bank.
183	sd	pv	s	50 ft. from E. Branch Croton	....	....	....	J. Shay	Carmel	Privy ten feet from river.
184	d	pv	s	50 ft. from E. Branch Croton	....	....	....	Mr. Purdy	North Salem.	
185	h	b by	h	100 ft. from E. Branch Croton	....	....	....	W. Marshall	Carmel	Summer boarding-house.
186	d	b	vh	100 ft. from E. Branch Croton	....	....	....	Mr. Chamberlain	Southeast	
†187*	sd	pv	....	On b'nk of E Branch Croton	...	...	....	W. Ganong	Southeast	Privy ten feet from river,
188	sd	pv	vh	75 ft. from E. Branch Croton	....	....	....	Mrs. Hitt	Southeast	
189	sd	pv	vh	50 ft. from E. Branch Croton	....	....	....	M. Tully	Southeast	
190	fh	b by	h	100 ft. from E Branch Croton	40	5	8	T. H. & A. Theall	Southeast	
191	sd	pv	vh	400 ft. from E. Branch Croton	....	...	....	T. H. & A. Theall	Southeast	
192	fh	b by	h	200 ft. from E. Branch Croton	20	2	2	F. Knox	Southeast	
193	fh	b by	h	300 feet from brook	25	4	5	G. Wood	Southeast	
194	sh	pv	s	50 feet from brook	....	....	....	....	Southeast	School-house.
195	fh	b by	h	400 feet from brook	30	6	8	W. Drew	Southeast	
196	g	......	h	150 feet from brook	....	....	....	W. Drew	Southeast	Private cemetery.
197	fh	b by	h	100 feet from brook	20	2	3	R. Ellis	Southeast	
198	fh	b by	h	100 feet from brook	25	2	3	I. Field	Southeast	
199	fh	b by	s	100 feet from brook	20	3	3	H. Bailey	Southeast	
200	fh	b by	h	200 feet from brook	....	..	....	W. Delavan	Southeast	
201	fh	b by	h	200 feet from brook	30	4	5	N. Rundle	Southeast	
202	fh	b by	s	100 ft. from E. Branch Croton	12	1	3	S. Bloomer	Southeast	Barn on opposite side of road from house.
203	fh	b by	h	200 feet from brook	30	4	5	C. Everett	Southeast	
207	d	pv	h	200 ft. from E. Branch Croton	1	....	2	J. Kierce	Southeast	
†208	d	sh	h	100 ft. from E. Branch Croton	....	....	....	C. Waldron	Southeast	Slaughter-house fifty feet from river; kill four cattle a week.
*209	d	pv	s	25 ft. from E Branch Croton	....	....	....	F. Knox	Southeast	Privy ten feet from river.
*210	d	pv	s	25 ft. from E. Branch Croton	....	....	....	R. Rundle	Southeast	Privy ten feet from river.
†211 †212	2 sd	pvs	s	25 ft. from E. Branch Croton	....	....	...	Mr. Deal	Southeast	Privies on banks of river.
†213	sd	pv	s	25 ft. from E. Branch Croton	....	....	....	Mr. Tillotson	Southeast	Privy on bank of river.
214	10 sd	pvs	s	50 ft. from E. Branch Croton	....	....	....	W. H. Thomas	Southeast	Privies ten to fifty feet from river.

December 15, 1884.

215	......		h	700 feet from E. Br. Croton	....	....	....	....	Southeast ...	Brewster, pop. 2,000. Surface drainage runs into river. Tonetta brook runs through center of village. Sewer discharges into brook. Many houses have cesspool, a hole in the ground filled with cobble-stones. See sketch of Brewster, Plate IV.
	h†	......	....	Over Tonetta brook	....	....	....	Harlem R. R.	....	R. R. depot. Privy four feet from brook.
	h†	......	....	....	....	....	....	S. McMahon	....	Brewster House, 100 guests, drains into sewer.
	h†	......	....	....	....	....	....	M. Reynolds	....	Southeast House, fifty guests, drains into sewer.
	h†	s	....	....	....	5	....	P. Diehl	....	Bakery, water-closet and stable connected with sewer.
	†	s	....	....	....	15	....	E. H. Shove & Co	....	Livery stable, drains into sewer.
	d†	......	....	....	....	....	....	A. D. Field	....	House and urinal connected with sewer, privy not.
	d†	......	....	....	....	....	....	A. F. Lobdell	....	House and urinal connected with sewer, privy not.
	d	......	....	....	....	....	....	L. H. Roberts	....	House and urinal connected with sewer, privy not.
	d†	......	....	....	....	....	....	W. T. Ganong	....	House and urinal connected with sewer, privy not.
	d†	......	....	....	....	....	....	R. Hampton	....	House and urinal connected with sewer, privy not.
	d†	......	....	....	....	....	....	F. E. Foster	....	Water-closet drains into sewer.
	d†	......	....	....	....	....	....	S. O. Avery	....	Water-closet drains into sewer.
	h†	......	....	20 feet from E. Br. Croton	....	....	....	J. Baxter	....	Slaughter-house on level of bank; discharges refuse into river; kills 6 cattle weekly.
	d	pv	h	50 feet from E. Br. Croton	....	....	....	A. Ryder	....	
	d	pv	h	50 feet from E. Br. Croton	....	....	....	M. Flynn	....	
	d	pv	h	75 feet from E. Br. Croton	....	....	....	W. Brewster	....	
	h†	pv	s	On E. Br. Croton river	....	....	....	Borden Cond. Milk Co	....	Tenement, four families; privy ten feet from river.
	fh	b by	h	50 feet from E. Br. Croton	10	3	4	L. Van Scoy	....	
	p h	pv	h	50 feet from small brook	....	....	....	P. S. Smith	....	
	p h	pv	h	50 feet from small brook	....	....	....	Wm. Orman	....	
	p h	pv	h	50 feet from E. Br. Croton	....	....	....	James Gillins	....	
	3 sd	pvs	s	50 feet from small brook	....	....	....	Monigal / Kilcone	....	Privies five to thirty feet from brook.
	sd	pv	h	50 feet from small brook	....	....	....	Mrs. McIntyre	....	
	sd*	pv	s	10 feet from small brook	....	....	....	W. H. Thomas	....	
	sd	pp	s	100 feet from E. Br. Croton	....	....	2	William Langler	....	Pig-pen on bank of river.
	sh	......	h	100 feet from E. Br. Croton	....	....	....	....	....	Public school; privies 75 feet from river.
	d	pv	s	50 feet from small brook	....	....	....	C. Phillips	....	Privy on bank of brook.
	m†	......	....	On small brook	....	....	....	W. S. Paddock & Co.	....	Grist-mill; privy over brook.
	d*	pv	h	On small brook	....	....	....	H. Boyce	....	Privy ten feet from brook.

TABLE III — East Branch of Croton River — (*Continued*).

No.	Houses.	Outbuildings.	Elevation.	Distance.	Cows.	Horses.	Pigs.	Owner.	Town.	Remarks.
	d†*			Over small brook				E. C. Howes		Privy ten feet from brook.
	bs*	pv		Over small brook				Mr. Werniver		Blacksmith and carriage-shop; privy over brook.
	st†			On small brook				I. Losee		Grocery store and dwelling; privy over brook.
	m†	s	h	On E. Br. Croton		5		Borden Cond. Milk Co.		Condensed milk factory. Two water-closets discharge into the river; water for cleaning cans, vats for cooling, and refuse from condenser also; sixty to eighty hands; three cemented water-tight cess-pools on bank of river cleaned every year; contents put on land adjoining; stables on bank.
	d	pv	h	30 feet from East Br. Croton,				E. C. Fields	Southeast	Small brook through premises.
	fh	b by	h	100 ft. from East Br. Croton,	20	2	4			Small brook through premises.
	d	pv	s	50 feet from Tonetta brook.				W. Purdy		
	d	pv	s	40 feet from brook			2	M. McCabe		
	h	s	s	150 ft, from Tonetta brook.	1		2	J. Gilroy		Putnam Hotel, twenty-five guests.
	†h			On small brook						N. E. R. R. depot; water-closet and urinal discharge into small brook.
	sd	pp	s	25 feet from Tonetta brook,				Mrs. Hunt		
	5m									Five carriage and blacksmith shops.
	h	pp	s	100 ft. from East Br. Croton,			6	Senny and Yale		Slaughter-house in Southeast Center; refuse given to pigs; pig-pen on bank; slaughter fifteen cattle a week.
	m			On bank of small brook				George Cole		Carriage factory at Southeast Center.
	m			On bank of East Br. Croton,				I. Armstrong		Sash and blind factory and grist-mill at Southeast Center.
	5sd	pvs	h	300 ft. from East Br. Croton.						At Southeast Center.
	d	s	h	100 ft. from East Br. Croton,		2	2	E. Wright		At Southeast Center.
	bs		h	100 ft. from East Br. Croton,				W. W. Weed		At Southeast Center.
	d	pv	h	50 feet from East Br. Croton.				Mrs. Thompson		At Southeast Center.
216	d m	pv	s	50 feet from small brook				T. Foster	Southeast	Tannery.
*217	sd	pv		On small brook				T. Foster	Southeast	On level with bank; privy 3 ft. from brook.
*218	d m	pv		On small brook		2		George Foster	Southeast	Grist-mill.
219	d	pp	h	25 feet from East br. Croton,			2	H. Paddock	Southeast	

220	fh	b by	h	150 feet from small brook ..	35	3	5	H. Paddock.............	Southeast ...	
221	fh	b bv	h	100 feet from brook	10	1	3	H. Steven..	Southeast ...	
222	fh	b by	vh	600 feet from two brooks....	4	8	3	A. Crane...............	Southeast ...	Expect to have fifty cows.
223	fh	b by	s	On small brook	8	1	4	....	Southeast ...	Small brook drains barn-yard.
224	sd	pp	h	100 feet from Covill's br......	....	....	2	W. F. Fowler...........	Southeast ...	
225	sd	pv	h	150 feet from Covill's br.....	....	....	2	W. F. Fowler...........	Southeast ...	
226	m	......	....	On bank of Covill's br......	....	....	....	A. Brush	Southeast ...	Saw and grist-mill.
227	fh	b by	h	300 ft. from Covill's br......	22	6	....	W. F. Fowler...........	Southeast ...	Barn on opposite side of road and 30 feet from small brook.
228	fh	b by	s	300 ft. from Covill's br......	30	3	6	A. Brush...........	Southeast ...	100 feet from small brook.
229	sd	pv	s	50 feet from small brook ...	....	....	....	A. Brush................	Southeast ...	Privy vault fifteen feet from brook.
230	d	b by	s	200 feet from Covill's br.....	8	....	2	J. Haines...............	Southeast ...	
231	fh	b by	s	100 feet from Haines lake ..	20	3	5	S. Haines...............	Southeast ...	Ice-house on opposite side of road on bank of pond. Small brook through premises.
232	fh	b by	h	75 feet from Haines lake...	20	2	4	J. Haines...............	Southeast ...	
233	fh	b by	s	50 feet from small brook...	25	7	4	H. Fowler	Southeast ...	
234	fh	b by	h	50 feet from small brook....	30	4	5	....	Southeast ...	
235	h	s	h	750 feet from Peach lake....		10	....	T. C. Vaile	Southeast ...	Summer boarding-house, 100 guests.
236	h	s	h	50 feet from Peach lake.....	....	2	...	N. Briggs...............	Southeast ...	Summer boarding-house.
†237	fh	b by	h	200 ft. from East Br. Croton,	75	15	20	S. S. Barnum...........	Southeast ...	Barns on opposite side of road and 100 ft. from river; barn-yard drains into river.
238	sd	pv	h	200 ft. from East Br. Croton,	....	....	....	H. C. Barnum...........	Southeast ...	
†239	d	pv	....	100 ft. from E. B'nch Croton.	....	....	....	S. S. Barnum...........	Southeast ...	Saw, grist and cider-mills on bank; refuse from cider-mill thrown into river.
†240	fh	b by	h	100 ft. from E. B'nch Croton.	18	1	3	J. Martin	Southeast ...	Small brook drains barn-yard.
241	fh	b by	s	150 feet from small brook...	35	3	4	J. O. Connor............	Southeast ...	
†242	d	b by	h	On small brook............	1	....	2	G. Eastwood	Southeast ...	Small brook drains barn-yard.
243	2 sd	pv	s	100 ft. from E. B'nch Croton.	....	....	....	S. S. Barnum...........	Southeast ...	
†244	fh	b by	h	¼ mile fr'm E. B'nch Croton.	50	4	6	W. S. Paddock & Co	Southeast ...	Small brook drains barn-yard.
245	fh	b by	h	300 ft. from E. B'nch Croton.	6	1	2	J. Connors	Southeast ...	
246	......	......	h	On East Branch Croton	....	....	....	....		Milltown; population, fifty; surface drainage into river.
	†·m	by	....	On East Branch Croton	....	....	....	J. Boyce	Southeast ...	Saw and grist-mill: brook drains barn-yard; privy two feet from brook, built on wooden boxes, which are emptied when full.
247	d	pp	h	300 ft. from E. B'nch Croton.	....	....	10	Hadden Bros...........	Southeast ...	Slaughter house: kill five cattle a week.
248	fh	b by	s	300 ft. from E. B'nch Croton.	40	3	4	R. Richie	Southeast ...	Barn on opposite side of road.
†249	fh	b by	h	½ mile fr'm E. B'nch Croton.	25	2	4	W. Gay	Southeast ...	Small brook drains barn-yard.
250	fh	b by	s	100 ft. from Daly brook......	40	4	6	M. Horton	Southeast ...	
251	fh	b by	h	50 ft. from Daly brook.......	20	2	4	D. Ganung	Southeast . .	Pig pen.
252	d	b by	s	50 ft. from Daly brook.......	....	....	....	P. Foster	Southeast ...	
253	d	pv	s	50 ft. from Daly brook.	....	....	....	H. Ganung	Southeast ...	Former tannery on brook.
254	fh	b by	h	250 ft. from Daly brook......	3	1	6	S. S. Barnum...........	Southeast ...	
255	fh	b by	h	50 ft. from Daly brook.......	4	1	....	Mrs. Solomons..........	Southeast ...	
256	fh	b by	h	125 ft. from Daly brook......	10	2	4	O. Solomons............	Southeast ...	
257	fh	b by	h	500 ft. from E B'nch Croton.	3	....	2	Mr. Tompkins	Southeast ...	
258	fh	b by	s	250 ft. from E. B'nch Croton.	10	2	4	M. Isenberg............	Southeast ...	
259	fh	b by	h	700 ft. from E. B'nch Croton.	35	3	7	J. Crane	Southeast ...	
260	......	b by	....	75 ft. from E. Branch Croton.	30	4	6	V. E. Barnum...........	Southeast ...	

TABLE III — East Branch of Croton River — (*Continued*).

Number.	Houses.	Outbuildings.	Elevation.	Distance.	Cows.	Horses.	Pigs.	Owner.	Town.	Remarks.
261	fh	b by	s	100 ft. from E. B'nch Croton.	30	3	2	Mrs. Morehouse	Southeast	
†262	fh	b by	vh	500 ft. from E. B'nch Croton.	10	2	5	C. Northrop	Patterson	Small brook drains barn-yard.
*263	sd	pv	....	On bank of brook	....	....	....	J. Crane	Southeast	
264	fh	b by	s	100 feet from brook	10	1	3	Mr. Shepard	Southeast	
265	fh	b by	s	50 feet from brook	15	2	4	Mrs. Barnum	Southeast	
266	fh	b by	h	100 feet from brook	25	2	3	V. Barnum	Southeast	
267	fh	b by	s	150 feet from brook	8	2	3	Mrs. Barnum	Southeast	
268	fh	b by	s	300 ft. from E. B'nch Croton.	3	1	2	R. W. Howes	Patterson	
269	d	b by	h	50 feet from small brook	3	....	....	S. Dowdy	Patterson	Privy four feet from brook.
270	d	b by	s	50 feet from small brook	4	1	....	A. Kinner	Patterson	Privy ten feet from brook.
271	fh	b by	h	400 feet from brook	27	2	3	J. Haviland	Patterson	
†272	fh	b by	vh	1,100 feet from brook	50	4	10	E. Haviland	Patterson	Small drain from barn-yard.

December 17, 1884.

Number.	Houses.	Outbuildings.	Elevation.	Distance.	Cows.	Horses.	Pigs.	Owner.	Town.	Remarks.
273	fh	b by	h	400 feet from Tonetta brook.	4	1	3	W. Ganong	Southeast	
274	fh	b by	s	50 feet from Tonetta brook.	4	1	2	Dr. Nixon	Southeast	
275	......	b by	h	150 feet from Tonetta brook.	4	....	...	E. Rundle	Southeast	
278	fh	b by	vh	1,000 ft. from Tonetta brook.	25	2	5	T. Reed estate	Southeast	
279	......	......	s	150 feet from small brook	....	....	....	....	Southeast	Dykeman's; population forty; surface drainage into brook.
280	......	b by	s	50 feet from brook	28	....	20	O. O'Brien	Southeast	
281	sd	pv	....	25 feet from brook	....	....	....	Mrs. Dykeman	Southeast	
282	......	b by	s	50 feet from brook	26	2	6	Mrs. Dykeman	Southeast	
283	h	pv	s	50 feet from ice pond	....	....	....	Croton Ice Co	Patterson	Boarding-house; 100 men during winter.
283½	fh	b by	h	300 feet from ice pond	30	4	7	W. Mabie estate	Patterson	
†284	fh	b by	h	Near Mud pond	30	3	6	S. Brewster	Southeast	Small brook drains barn-yard; drainage very much discolored.
285	fh	b by	s	100 feet from small brook	10	2	4	J. Minor	Southeast	Also house on opposite side of road.
286	fh	b by	s	Near Mud pond	25	3	5	J. W. Haviland	Southeast	Small brook drains barn-yard.
†287	fh	b by	h	Near Mud pond	25	3	5	A. Sears	Southeast	Small brook drains barn-yard.
288	fh	b by	s	Near Mud pond	20	2	2	F. S. Barnum	Southeast	Small brook through premises.
†289	fh	b by	h	On small brook	75	5	12	A. S. Doane	Southeast	Brook drains barn-yard.
290	6 sd	pvs	s	....	....	....	....	....	Southeast	Gayville; twenty-five to fifty feet of two small brooks.

291	fh	b by	h	150 feet from brook	1	1	2	G. Palmer	Southeast	
292	fh	b by	h	150 feet from brook	20	2	6	L. Sherwood	Southeast	
293	fh	b by	h	120 feet from brook	23	3	6	B. F. Foster	Southeast	
294	fh	b by	h	250 feet from brook	20	2	8	L. Sherwood	Southeast	
295	d	b by	h	350 feet from brook	1	....	2	C. Rice	Southeast	
296	d	pv	h	500 feet from brook	....	....	....	E. Budd	Southeast	
297	fh	b by	h	1,000 feet from Mud pond	30	3	6	E. Budd	Southeast	
298	fh	b by	h	200 feet from Mud pond	12	2	4	E. Howes	Southeast	
299	d	pv	h	200 feet from Mud pond	....	....	....	H. Marsh	Southeast	
300	d	pv	h	300 feet from Mud pond	2	2	....	E. Elwell	Southeast	
301	fh	b by	s	40 feet from small brook	22	2	4	I. Townsend	Southeast	
†302	fh	b by	h	On small brook	2	1	....	W. Townsend	Southeast	Brook drains barn-yard.
303	fh	b by	h	¼-mile from Tonetta pond.	50	6	8	G. Hines	Southeast	
304	fh	b by	s	100 feet from brook	20	2	....	Dr. Nickerson	Southeast	
305	fh	b by	h	100 feet from brook	10	1	2	R. Newman	Southeast	
306	fh	b by	s	100 feet from brook	40	3	....	A. Rudd	Southeast	
307	fh	b by	h	300 feet from brook	50	5	9	B. Everett	Southeast	
308	fh	b by	h	500 feet from brook	33	3	6	A. Townsend	Southeast	

December 18, 1884.

309	fh	b by	h	50 feet from small brook	14	1	5	W. Cary	Patterson	Privy vault and pig-pen on bank of brook.
310	sd	pv	h	50 feet from small brook	....	....	....	W. Cary	Patterson	
311	fh	b by	h	200 feet from E. Br. Croton	7	1	....	Mr. Purdy	Patterson	
312	fh	b by	h	200 feet from E. Br. Croton	5	1	2	J. Hartwell	Patterson	
†313	fh	b by	h	200 feet from E. Br. Croton	30	2	4	G. Brower	Patterson	Privy vault over small brook.
314	sd	pv	h	200 feet from E. Br. Croton	....	....	....	G. Brower	Patterson	
315	fh	b by	h	200 feet from E. Br. Croton	20	2	4	D. Jennings	Patterson	
316	fh	b by	h	500 feet from E. Br. Croton	10	2	3	G. W. Kinner	Patterson	Barn on opposite side of road.
317	fh	b by	h	300 feet from Quaker brook.	8	4	4	B. Carl	Patterson	
318	st	......	....	On bank of Quaker brook	....	....	....	B. Carl	Patterson	Grocery: privy 25 feet from brook.
319	......	b	....	200 feet from E. Br. Croton	....	....	....	J. Haines	Patterson	Filled with hay: on level with river.
320	fh	b by	vh	800 feet from E. Br. Croton	15	2	5	J. Haines	Patterson	
321	pd	pv	h	200 feet from Quaker brook.	....	....	....	Mr. Carter	Patterson	
322	fh	b by	h	200 feet from Quaker brook.	14	2	....	C. W. Patrick	Patterson	
323	sd	pv	h	200 feet from Quaker brook.	....	....	....	E. Wheeler	Patterson	
324	fh	b by	h	200 feet from Quaker brook.	3	...	3	W. Goodsell	Patterson	Brook through premises: barn on opposite side of road.
325	d	pv	h	200 feet from Quaker brook.	8	1	2	E. Leonard	Patterson	
326	sd	pv	h	200 feet from Quaker brook.	....	....	....	W. Searles	Patterson	
327	fh	b by	h	500 feet from Quaker brook.	30	2	8	N. Jennings	Patterson	Barn twenty feet from small brook.
328	fh	b by	h	300 feet from Quaker brook.	16	2	3	S. Whitehouse	Patterson	Small brook through premises.
329	sd	pv	s	150 feet from Quaker brook.	....	....	....	S. Whitehouse	Patterson	
330	sd	pv	s	150 feet from Quaker brook.	....	....	....	T. Caden	Patterson	
331	fh	b by	h	200 feet from Quaker brook.	14	3	4	B. Haviland	Patterson	
332	m	......	...	On bank of Quaker brook	....	....	....	C. P. Boughton	Patterson	Cider and grist-mill.
333	fh	b by	h	700 feet from Quaker brook.	16	2	3	S. Barnum	Patterson	
334	fh	b by	h	400 feet from Quaker brook.	1	....	2	F. Birch	Patterson	
†335	fh	b by	vh	150 feet from small brook	2	....	3	F. Grover	Patterson	Small drain from barn-yard to brook.

TABLE III — East Branch of Croton River — (*Continued*).

Number.	Houses.	Outbuildings.	Elevation.	Distance.	Cows.	Horses.	Pigs.	Owner.	Town.	Remarks.
336	sd	pv	vh	125 feet from small brook ..	....	....	....	O. Sweeney.............	Patterson....	
337	fh	b by	vh	150 feet from small brook ..	10	....	....	T. State................	Patterson....	
338	fh	b by	vh	150 feet from small brook ..	....	....	....	D. Jennings,...........	Patterson....	
339	fh	b by	vh	150 feet from small brook ..	5	2	....	H. B. Jennings..........	Patterson....	
340	fh	b by	h	500 ft. from E. B'nch Croton.	20	3	3	George Wright	Patterson....	Fifty feet from small brook.
341	fh	b by	vh	1,000 ft. from E. B'nch Croton	40	7	5	R. T. Haviland..........	Patterson....	One hundred and fifty feet from small brook.
342	fh	b by	h	800 ft. from E. B'nch Croton.	30	3	6	J. Gerrow	Patterson....	
343	fh	b by	h	1,000 ft. from E. B'nch Croton	40	6	5	W. O. Taylor...........	Patterson....	Sixty feet from small brook.
†344	fh	b by	h	On small brook ,............	40	6	3	S. Mabie................	Patterson....	Brook drains barn-yard.
345	fh	b by	h	1,200 ft. from E. B'nch Croton	20	3	...	E. G. Palmer	Patterson....	
346	fh	b by	s	60 feet from brook	45	3	13	Mrs. Stevens	Patterson....	
347	3 d	b by	h	100 feet from small brook ..	46	4	10	D. C. Aiken.............	Patterson....	Barn-yard ten feet from brook.
348	d	pv	h	50 feet from small brook ...	....	....	....	D. Aiken................	Patterson....	
349	d	pv	h	75 feet from small brook ...	....	....	....	D. Aiken................	Patterson....	
350	fh	b by	h	200 feet from small brook ..	23	2	3	D. Jennings............	Patterson....	

December 20, 1884.

Number.	Houses.	Outbuildings.	Elevation.	Distance.	Cows.	Horses.	Pigs.	Owner.	Town.	Remarks.
†351	d	b	....	25 ft. from E. B'nch Croton.	....	....	....	J. Thorp................	Patterson....	Level with bank; barn on bank; barn-yard drains into river; expects to put in sewer from house.
352	d	pv	s	50 ft. from E. B'nch Croton.	....	....	....	J. Gurne................	Patterson....	
353	......	......	s	600 ft. from E. B'nch Croton.	....	....	....	....	Patterson....	Patterson; population, 400; surface drainage into river. See sketch, Plate IV.
....	m	......	....	100 feet from brook	....	....	....	J. Haight...............	....	Cement factory.
354	fh	b by	h	50 feet from brook	7	2	....	L. E. Holmes...........	Dutchess Co.	
355	st	......	....	On bank of small brook....	....	....	....	L. E. Holmes...........	Dutchess Co.	General store.
†356	fh	b by	vh	50 feet from small brook....	30	2	....	J. Holmes	Dutchess Co.	Blacksmith shop. Small drain from barn-yard.
357	d	pv	vh	50 feet from brook	....	....	....	J. Holmes	Dutchess Co.	
358	d	b	vh	40 feet from brook	....	....	....	Mrs. Dykeman..........	Dutchess Co.	
359	fh	b by	vh	150 feet from brook	5	1	...	J. Parker	Dutchess Co.	
360	fh	b by	s	25 feet from small brook....	7	1	3	W. Baker...............	Patterson....	
361	d	pv	h	100 feet from small brook...	....	....	....	R. Smith................	Patterson....	
362	d	pv	h	100 feet from small brook...	....	....	....	G. Holmes..............	Patterson....	
363	fh	b by	h	50 feet from small brook....	6	4	10	G. Cusna	Patterson....	

†364	fh	b by	h	200 feet from small brook	50	2	3	Mr. Ballard	Patterson	Small stream drains barn-yard.
†365	fh	b by	h	50 feet from small brook	30	6		S. Judd	Patterson	Small stream drains barn-yard.
366	fh	b by	s	100 feet from small brook	10	3	3	G, T. Dean	Patterson	Barn thirty feet from brook.
367	d	b	s	100 feet from small brook				J. Eastwood	Patterson	
368	d	s	s	50 feet from small brook		2		B, Peck	Patterson	
369	6 sd	pvs	s	50 feet from small brook				M. K. Lee	Patterson	Two privies three feet from bank. Grist and saw-mill on bank.
370	d	b by	s	50 feet from small brook	2	2		J. W. Townsend	Patterson	
371	d	b	s	50 feet from small brook	1	6		Mrs. Kent	Patterson	
372	d	b by	s	150 feet from small brook		2		R. Patterson	Patterson	
373	fh	b by	h	500 feet from small brook	12	3		D. Segar	Patterson	
374	fh	b by	h	500 feet from small brook	35	4	3	T. Baldwin	Patterson	
375	fh	b by	h	500 feet from small brook	25	2	4	E. Kent	Patterson	
376	fh	b by	vh	200 ft. from E. branch Croton	30	3	4		Patterson	
377	fh	b by	h	150 feet from small brook	15	2	4	M. Williams	Patterson	
378	fh	b by	h	400 ft. from E. branch Croton	20	3	4	A. Palmer	Patterson	

December 22, 1884.

379	fh	b by	s	60 feet from small brook	25	2	3	A. Ballard	Patterson	
380	fh	b by	s	100 feet from brook	15	2	3	M. Segar	Patterson	Barn and barn-yard on opposite side of road.
381	fh	b by	h	100 feet from brook	12	2	3	Mr. Parker	Patterson	Barn and barn-yard on opposite side of road.
382	fh	b by	h	200 feet from brook	45	4	4	Mrs. St. John	Patterson	Small drain fifty feet from barn-yard.
383	fh	b by	h	200 feet from small brook				Mrs. St. John	Patterson	
384	fh	b by	h	200 feet from drain	30	2	4	H. Rogers	Patterson	Barn and barn-yard on opposite side of road, one hundred feet from drain.
†385	fh	b by	h	50 feet from brook	35	4	5	D. B. Peck	Patterson	Barn-yard twenty-five feet from brook. Small drain from barn-yard.
†386	fh	b by	s	300 feet from brook	30	2		C. Ballard	Patterson	Small drain from barn-yard. Barn and barn-yard on opposite side of road, high elevation, sixty feet from brook.
†387	fh	b by	h	500 feet from brook	25	6	3	W. A. Turner	Patterson	Small drain from barn-yard.
388	d	s	h	50 feet from drain				Mr. Johnson	Patterson	
†389	fh	b by	h	500 feet from brook	30	3	2	P. S. Penny	Patterson	Small drain from barn-yard, ten feet from stable.
390	fh	b by	h	300 feet from brook	25	5	4	M. Peck	Patterson	
391	m			On bank of small brook				M. Peck	Patterson	Grist and feed mill (now gone).
392	fh	b by	h	350 feet from brook	30	2	5	W. A. Taylor	Patterson	
393	fh	b by	h	300 feet from brook	10	2	3	J. Knapp	Patterson	
394	fh	b by	h	50 feet from brook	3	1		D. Nixon	Patterson	
395	d	s	h	25 feet from brook				D. Nixon	Patterson	Stable five feet from brook.
†396	fh	b by	h	100 feet from brook	20	3	5	R. B. Merrick	Patterson	Privy over a small brook.
397	fh	b by	h	500 feet from brook	30	4	3	E. T. Smith	Patterson	Small brook through premises.
398	fh	b. by	h	100 feet from brook	60	6	8	L. G. Robinson	Patterson	
399	d	b by	h	50 feet from brook				L. G. Robinson	Patterson	
400	fh	b by	h	300 feet from brook	8	1	2	N. Tompkins	Patterson	
401	d	s	h	50 feet from brook				Mrs. S. Kent	Patterson	

TABLE III — East Branch of Croton River — (*Continued*).

Number.	Houses.	Outbuildings.	Elevation.	Distance.	Cows.	Horses.	Pigs.	Owner.	Town.	Remarks.
402	fh	b by	h	150 feet from brook	100	10	10	W. J. Robinson	Patterson	
403	fh	b by	h	50 feet from brook	20	2	...	J. Haviland	Patterson	Saw and grist-mill on bank of brook, J. Penny owner.
404	sh	pv	s	50 feet from brook	....	....	....	....	Patterson	Privy three feet from drain, which discharges into brook.
†405	fh	b by	s	50 feet from brook	5	2	....	J. Penny	Patterson	Small drain from barn-yard.
406	sd	pv	h	100 feet from brook	....	....	....	J. Cotton	Patterson	Privy two feet from brook.
407	fh	b by	vh	200 feet from brook	40	4	....	C. H. Towner	Patterson	Fifty feet from small brook.
408	......	......	s	100 feet from brook	....	....	....	....	Patterson	Towners Station, population 100. Surface drainage into brook.
	d	pv	....	....	....	....	....	A. S. Cole	....	Ten feet from brook.
†409	fh	b by	s	Near brook	30	4	....	Mrs. Cherry	Patterson	Small brook drains barn-yard.
†410	fh	b by	h	300 feet from brook	20	2	3	B. Parker	Patterson	Small brook drains barn-yard.
411	fh	b by	h	300 feet from brook	20	3	4	N. W. Palmer	Patterson	

December 23, 1884.

Number.	Houses.	Outbuildings.	Elevation.	Distance.	Cows.	Horses.	Pigs.	Owner.	Town.	Remarks.
412	fh	b by	h	300 ft. from E. br'ch Croton,	40	3	....	S. Baldwin	Patterson	Small brook 100 feet from barn-yard.
413	fh	b by	h	500 ft. from E. br'ch Croton,	30	2	....	K. Hinyon	Patterson	Small brook fifty feet from barn.
414	fh	b by	h	500 ft. from E. br'ch Croton,	25	2	....	G. H. Aiken	Patterson	
†415	fh	b by	h	500 ft. from E. br'ch Croton,	3	3	....	O. E. Howes	Patterson	Small brook drains barn-yard.
*416	sd	pv	....	On bank of brook	....	....	...	O. E. Howes	Dutchess Co.	
417	fh	b by	h	100 feet from branch	50	6	7	G. P. Tabor	Dutchess Co.	
418	fh	b by	s	50 feet from branch	40	3	3	J. E. Baldwin	Dutchess Co.	Grist mill on bank.
419	d	b	s	50 feet from branch	2	....	4	L. Murphy	Dutchess Co.	Saw and cider mills on bank. Privy ten feet from river.
420	fh	b by	s	50 feet from branch	125	7	....	I. Aikman	Dutchess Co.	
421	fh	b by	s	100 feet from branch	50	4	....	R. Dodge	Dutchess Co.	
422	fh	b by	h	50 feet from brook	25	3	2	A. Light	Dutchess Co.	
423	fh	b by	h	200 feet from brook	40	3	8	A. Arnold	Dutchess Co.	Barn and barn-yard 100 feet from brook.
424	fh	b by	h	100 feet from small brook	20	3	5	W. Arnold	Dutchess Co.	
425	d	b by	s	100 feet from branch	30	6	30	J. B. Dutcher	Dutchess Co.	
*426	......	......	h	....	....	....	....	....	Dutchess Co.	Pawling, pop. 7,000. West branch of East branch of Croton river runs through village. Two small brooks which flow towards the north and run into Connecticut also. Surface drainage into all three.

.....	bs	......	....	50 feet from branch........	....	....	....	A. Watkins...............	....	
.....	h	......	....	....	....	....	....	....	....	Dutcher House, water-closet and urinal connect with brook running north.
.....	2d	......	....	50 feet from branch........	....	....	....	P. Gory, G. Norton......	....	Privy three feet from branch.
.....	7d	......	....	50 feet from branch........	....	....	....	Mrs. Hector, T. Arnold, Mrs. Stark, J.L. White, A. Watkins, Mrs.Scully, G.Turner	....	Privy ten feet from branch.

Middle Branch of Croton River — *December* 13, 1884.

204	fh	b by	s	25 feet from brook..........	10	1	3	G. Kniffin................	Southeast....	
205	fh	b by	h	200 feet from brook.........	20	2	3	F. Haines.................	Southeast....	
206	fh	b by	h	30 feet from brook..........	15	2	4	F. Knox...................	Southeast....	
427	fh	......	h	800 ft. fr. Mid. br. Croton..	20	2	4	D. F. Brown.............	Carmel.......	
......	d	b by	h	100 ft. fr. Mid. br. Croton..						
428	fh	b by	h	300 ft. from Mid. br. Croton..	....	2	3	G. W. Gregory...........	Carmel.......	
429	fh	b by	h	500 ft. from Mid. br. Croton..	20	2	3	G. W. Gregory...........	Carmel.......	
430	m	......	....	On bank of Mid.br. Croton..	....	....	....	G. W. Gregory...........	Carmel.......	Saw and grist-mill.
431	fh	b by	s	100 ft. from Mid. br. Croton..	....	....	....	F. Willis..	Carmel.......	100 hundred feet from small brook.
422	fh	b by	h	100 ft. from Mid. br. Croton..	....	....	....	T. Drew..................	Southeast....	
433	d	b	h	200 ft. from Mid. br. Croton..	....	....	..	Mrs. Ely	Carmel.......	
434	d	b	h	100 ft. from Mid. br. Croton..	1	....	2	Mrs. Haviland...........	Southeast....	
435	3sd	pvs	....	50 feet from brook..........	....	....	....	Theall Iron Co.........	Carmel & Southeast	Iron mine 200 feet from brook.
435½	sd	b	h	100 ft. from Mid. br. Croton..	...	....	....	F. Cozens................	Southeast....	
436	fh	b by	h	300 ft. from Mid. br. Croton..	20	2	4	J. E. Kelly	Southeast....	
437	sd	pv	h	100 feet from brook.........	....	....	....	J. E. Kelly...............	Southeast....	
438	fh	b by	h	100 feet from brook..........	20	2	5	T. Drew..................	Southeast....	
439	sd	pv	h	50 feet from brook...........	...	....	....	T Drew..................	Carmel.......	
440	fh	b by	h	200 feet from brook..........	36	2	4	S. Ferris.................	Carmel.......	Barn and barn-yard 50 feet from brook.
441	d	pv	h	100 feet from small brook...	....	....	....	S. Ferris.................	Carmel.......	
442	sd	pv	h	100 feet from small brook...	....	....	....	C. Manus................	Carmel.......	
443	fh	b by	h	100 feet from small brook...	14	3	....	J. Wood..................	Carmel.......	
444	fh	b by	h	200 feet from brook..........	19	3	....	W. Everett...............	Carmel.......	
445	fh 2d	b by pvs	h	50 feet from brook...........	5	1	2	Mrs. Griffin.............	Carmel.......	
446	sd	b	h	50 feet from brook...........	....	....	....	M. Morse.................	Carmel.......	
447	fh	b by	h	50 feet from brook...........	35	4	4	A. H. Hopkins...........	Carmel.......	
448	sd	pv	h	100 feet from brook..........	....	....	....	Mr. Clapp................	Carmel.......	
449	2d	p vs	h	150 feet from brook..........	....	....	....	Seymour and Cole......	Carmel.......	
450	fh	b by	h	100 feet from brook..........	15	2	...	W. Everett	Carmel	
451†	fh	b by	s	Near Mid. br. Croton	15	3	3	T. Kelley	Carmel	Small brook drains barn-yard.
452	fh	b by	h	100 feet from brook	13	2	....	W. H. Foster	Carmel	
453	fh	b by	s	50 feet from brook	15	3	3	T. Kelley	Carmel	
454	sd	pv	h	50 feet from brook..........	...	....	....	A. Hyatt..................	Carmel	
455	fh	p by	h	250 feet from brook..........	75	6	7	A. Hyatt............	Kent	

TABLE III — MIDDLE BRANCH OF CROTON RIVER — (*Continued*).

December 26, 1884.

No.	Houses.	Outbuildings.	Elevation.	Distance.	Cows.	Horses.	Pigs.	Owner.	Town.	Remarks.
456	sd	b	h	50 feet from Mid. br. Croton	....	....	....	F. Haines	Southeast ...	
457	2 sd	pvs	h	50 feet from Mid. br. Croton	....	....	...	Dept. Public Works	Southeast ...	Privies on bank of river.
458	2 sd	pvs	h	75 feet from Mid. br. Croton	....	....	....	Dept. Public Works	Southeast ...	
459	sd	pv	h	50 feet from Mid. br. Croton	....	....	....	Dept. Public Works	Southeast ...	
460	fh	b by	h	100 ft. from Mid. br. Croton.	30	4	5	R. Kirkman	Southeast . .	
461	fh	b	h	100 ft. from Mid. br. Croton.	....	....	....	N. Smith	Southeast ...	
462	sd	b by	s	Near Mid. br. Croton	20	....	....	Mrs. Barber	Carmel	Small brook through farm.
463	fh	b by	h	100 ft. from Mid. br. Croton.	10	2	3	A. Johnson	Southeast ...	
464	fh	b by	h	200 ft. from Mid. br. Croton.	25	4	5	E. F. Fowler	Southeast ...	
465	fh	b by	h	200 ft. from Mid. br. Croton.	8	2	3	T. Kelley	Southeast ...	
466	25 sd	pvs	h	500 ft. from Mid. br. Croton.	....	....	....	T. F. Mining Co.	Southeast ...	Tilly Foster Iron Mine; thirteen houses 100 feet from river, twelve from 400 to 500 feet from river.
467	fh	b by	s	150 ft. from Mid. br. Croton.	25	2	3	J. Kelley	Southeast ,..	

December 27, 1884.

No.	Houses.	Outbuildings.	Elevation.	Distance.	Cows.	Horses.	Pigs.	Owner.	Town.	Remarks.
468	fh	b by	h	50 feet from small brook....	30	3	4	T. Kelley	Southeast ...	
469	fh	b by	h	50 feet from small brook....	35	6	4	W. Pugsley	Southeast ...	
470	......	b by	h	50 feet from brook	15	....	....	C. Foster	Southeast ...	Now gone.
471	fh	b by	h	50 feet from brook	15	4	6	C. Foster	Southeast ...	
472	fh	b by	h	100 feet from brook	24	3	7	E. Holmes	Southeast ...	Cider-mill.
473	m	......	....	On Beaver brook	....	....	....	E. F. Fowler	Southeast ...	Saw-mill.
474	fh	b by	h	200 feet from small brook..	40	3	4	J. T. Barrett	Southeast ...	
475	sd	pv	s	100 ft. from br. Beaver br'k.	....	....	....	O. & E. Field	Patterson ...	
476	fh	b by	h	250 ft. from br. Beaver br'k.	30	3	6	J. Hopkins	Patterson ...	
477	fh	b by	h	30 ft. from br. Beaver brook	35	4	7	O. & E. Field	Patterson ...	Barn-yard five feet from brook.
478	sh	pv	vh	400 ft. from br. Beaver br'k.	....	....	....	...	Patterson ...	
479	fh	b by	s	50 ft. from br. Beaver brook	30	2	3	C. Ryder	Patterson ...	
480	fh 2 sd	b by pvs	s	200 ft. fr'm br. Beaver br'k 100 ft. fr'm br. Beaver br'k	15	3	6	C. Hobby	Patterson ...	
481	fh	b by	h	50 ft. from br. Beaver brook	10	1	3	C. Russell	Patterson ...	
482	fh	b by	h	100 ft. from Mid. br. Croton.	17	2	3	D. Warren	Carmel	
483	m	......	....	On bank of Mid. br. Croton.	....	....	....	J. Smith	Carmel	Grist-mill.
484	fh	b by	h	200 ft. from Mid. br. Croton.	28	3	6	C. Lewis	Southeast ...	Barn on opposite side of road.
485	fh	b by	h	200 feet from small brook...	25	2	5	W. H. Foster	Carmel	

486	fh	b by	h	200 feet from brook	25	2	6	H. Barnes	Kent	
487	fh	b by	s	75 ft. from Mid. br. Croton,	8	2	....	H. Fowler	Kent	
488	fh	b by	h	150 feet from small brook	12	2	3	I. E. Hobby	Kent	
†489	fh	b by	s	On small brook	6	1	2	A. Hobby	Kent	Brook drains barn.
				December 29, 1884.						
490	fh	b by	h	600 ft. from Mid. br. Croton.	4	6	12	A. Mickles	Kent	
491	fh	b by	h	100 feet from small brook	27	4	11	D. Kent	Kent	
492	fh	b by	h	100 feet from brook	10	1	....	A. Townsend	Kent	
493	fh	b by	s	250 feet from brook	40	4	12	A. Townsend	Kent	
494	sd	b	h	200 ft. from Mid. br. Croton,	....	....	....	E. Smalley	Kent	
495	fh	b by	h	100 ft. from Mid. br. Croton,	2	1	2	D. Washburn	Kent	
496	fh	b by	h	100 ft. from Mid. br. Croton,	16	3	3	Mrs. Robinson	Kent	Barn on opposite side of road.
†497	fh	b by	h	200 ft. from Mid. br. Croton,	22	....	3	Miss Knapp	Kent	Privy over small brook. Barn on opposite side of road.
498	fh	b by	s	250 ft. from Mid. br. Croton,	17	3	7	J. Bennett	Kent	Small brook through premises.
499	fh	b by	s	200 ft. from Mid. br. Croton,	45	4	6	J. Sprague	Kent	100 feet from small brook.
*500	sd	pv	s	10 feet from brook	....	....	....	J. Sprague	Kent	
501	fh	b by	h	500 ft. from Mid. br. Croton,	15	....	....	J. Sprague	Kent	200 feet from small brook.
502	fh	b by	h	300 ft. from Mid. br. Croton,	30	3	5	R. Barber	Kent	100 feet from small brook.
503	sd	b	s	100 ft. from Mid. br. Croton,	....	1	....	J. Sprague	Kent	
504	sd	pv	s	50 ft. from Mid. br. Croton	....	....	....	J. Sprague	Kent	
505	d	b by	s	50 ft. from Mid. br. Croton	2	3	6	D. K Merritt	Kent	Saw and grist-mill on bank.
506	sd	pv	s	50 feet from Drew's pond	....	....	....	O. Bennett	Kent	
507	d	pv	s	100 feet from Drew's pond	....	....	....	Rev. Sherwood	Kent	
508	d	pv	s	50 feet from Drew's pond	....	....	....	P. Barrett	Kent	
509	sd	b by	s	25 feet from brook	10	1	....	A. White	Kent	
510	2sd	pvs	s	200 feet from small brook	....	....	....	W. Brown	Kent	Carriage factory on bank.
511	fh	b by	h	200 feet from brook	35	3	5	G. Sprague	Kent	
512	fh	b by	s	300 feet from brook	30	4	....	F. H. Luddington	Kent	
†513	bs	pv	....	Over brook	....	....	....	J. J. Hyatt	Kent	Privy over brook.
514	std	pv	....	50 feet from brook	....	....	....	J. Griffith	Kent	Grocery.
515	d	pv	s	25 feet from brook	....	....	....	H. P. Smith	Kent	
516	m	......	....	On small brook	....	....	....	H. P. Smith	Kent	Grist-mill.
517	fh	b by	s	25 feet from small brook	40	4	10	C. Townsend	Kent	
				December 30, 1884.						
†518	m	......	....	On bank of Broad brook	....	....	....	L. Baker	Carmel	Cider-mill. Refuse from mill thrown into brook.
519	m	......	....	On bank of Broad brook	....	....	....	L. Baker	Carmel	Grist-mill.
520	m	......	....	On bank of Broad brook	....	....	....	L. Baker	Carmel	Saw-mill.
521	fh	b by	h	100 feet from Broad brook	500	2	2	L. Knox	Carmel	
522	d	b by	h	75 feet from Broad brook	....	2	4	L. Baker	Carmel	
523	sd	pv	h	20 feet from Broad brook	....	....	....	Mrs. Bailey	Carmel	Privy about ten feet from brook.
524	fh	b by	h	100 feet from Broad brook	1	2	3	J. Drew	Carmel	
525	d	b	h	150 feet from Broad brook	1	1	1	T. Ganong	Carmel	
526	d	pv	h	100 feet from Broad brook	....	1	....	J. Ostrander	Carmel	

TABLE III — Middle Branch of Croton River — (*Continued*).

Number.	Houses.	Outbuildings.	Elevation.	Distance.	Cows.	Horses.	Pigs.	Owner,	Town.	Remarks.
527	d	b	h	250 feet from Broad brook	2	2	1	A. P. Mead	Carmel	
528	d	b	h	50 feet from Broad brook	....	1	....	J. Fagan	Carmel	
529	d	b	h	350 feet from Broad brook	3	2	3	Mrs. Stebbins	Carmel	
530	fh	b by	h	300 feet from Broad brook	21	2	1	D. B. Sheers	Carmel	
531	fh	b by	h	200 feet from Broad brook	...	....	....	....	Carmel	One hundred feet from small brook.
†532	fh	b by	h	150 feet from Broad brook	15	1	3	J. Ganung	Carmel	Small brook drains barnyard.
533	fh	b by	h	75 feet from Broad brook	5	2	3	O. Ganong	Carmel	
534	fh	b by	h	200 feet from Broad brook	1	1	2	A. Ganong	Carmel	
535	fh	b by	h	200 feet from Broad brook	3	2	2	B. Warren	Carmel	
†536	fh	b by	s	5 feet from Broad brook	4	1	....	A. Cole	Carmel	Barn and barnyard on opposite side of road and forty feet from brook; privy over brook.
537	d	b	s	25 feet from Broad brook	....	....	....	H. Wilbur	Carmel	
†538	fh	b by	s	50 feet from Broad brook	20	2	3	O. Breen	Carmel	Small brook drains barnyard.
539	fh	b by	h	50 feet from Broad brook	....	....	....	I. Pinckney	Carmel	Barn and barnyard on opposite side of road from house, and ten feet from brook.
540	m	......	....	On bank of Broad brook	....	....	....	M. Wright	Carmel	Saw-mill.
541	fh	b by	h	250 feet from Broad brook	10	2	3	M. Wright	Carmel	
542	sd	pv	h	150 feet from Broad brook	....	....	....	Mrs. O'Neil	Carmel	
543	sd	pv	s	25 feet from Broad brook	....	....	....	J. Craft	Carmel	Privy five feet from brook.
544	fh	b by	h	200 feet from Broad brook	20	2	3	E. H. Ganong	Carmel	Barn and barn-yard on opposite side of road.
545	d	pv	h	100 feet from Broad brook	....	....	....	H. Vredenburg	Carmel	One hundred feet from branch of Broad brook, also.
546	sd	pv	h	100 feet from Broad brook	....	....	....	O. Hazen	Carmel	
547	d	b pv	h	250 feet from branch	1	....	....	G. W. Austin	Carmel	
548	sd	pv	h	300 feet from branch	....	....	....	J. Smith	Carmel	
549	d	pv	s	20 feet from pond	....	....	....	S. Smith	Carmel	
550	fh	b by	s	200 feet from branch	30	2	....	O. Hazen	Carmel	
551	fh	b by	h	200 feet from branch	20	2	3	Smith & Bradley	Carmel	
552	sd	pv	vh	300 feet from branch	....	....	....	J. Wright	Carmel	
553	fh	b by	h	300 feet from branch	15	2	3	J. Wright	Carmel	Barn and barn-yard on opposite side of road one hundred feet from brook.
554	sd	b	s	300 feet from Broad brook	....	....	....	H. Ganong	Carmel	
555	d	b	vh	400 feet from Broad brook	4	2	3	H. Ganong	Carmel	
556	fh	b by	h	300 feet from Broad brook	20	2	4	E. Wright	Carmel	Barn-yard twenty feet from small brook.
557	fh	b by	h	200 feet from Broad brook	2	1	2	Mrs. Cole	Carmel	

558	m	......	s	100 feet from Broad brook..	....	....	....	N. C. Welsh........	Carmel	Carriage factory.
559	15 d	pvs	h	200 feet from Broad brook..	....	....	....	....	Carmel	Portion of village of Lake Mahopac about two hundred feet from branch Broad brook. Surface drainage runs into brook.
560	fh	b by	vh	200 feet from Mud pond.....	5	....	....	J. Cole	Carmel	
561	fh	b by	h	200 feet from brook	80	2	3	B. T. Crane...............	Carmel	Barn-yard drains into brook.
562	d	b by	s	Near brook..................	2	3	....	N. Foss	Carmel	
563	fh	b by	s	50 feet from branch.........	4	3	5	N. Springsteel	Carmel	

West Branch of Croton River—*January* 2, 1885.

564	fh	b by	s	300 ft. from W. branch Croton	15	2	3	J. Bilner.................	Carmel	Fifty feet from small brook.
565	d	b by	s	200 ft. from W. branch Croton	1	3	....	W. W. Everett	Carmel	Barn and barn-yard fifty feet from river.
566	sd	pv	h	100 ft. from W. branch Croton	....	....	....	R. B. Davis	Carmel	
567	d	b	h	100 ft. from W. branch Croton	2	1	....	H. Vores.................	Carmel	
†568	fh	b by	h	200 ft. from W. branch Croton	15	3	3	R. Davis	Carmel	Fifty feet from small brook which drains barn-yard.
569	sd	b	s	200 ft. from W. branch Croton	....	....	....	H. Green	Carmel	
570	fh	b by	h	700 ft. from W. branch Croton	15	4	5	D. D. Chamberlain	Carmel	
571	fh	b by	s	200 ft. from W. branch Croton	10	2	3	B. Russell	Carmel	Fifty feet from small brook. Privy five feet from brook.
572	fh	b by	h	200 ft. from W. branch Croton	5	2	...	L. H. Birchard..........	Carmel	Fifty feet from small brook.
573	sd	pv	vh	200 ft. from W. branch Croton	....	....	....	Mrs. Knapp	Carmel	
574	sd	pv	h	250 ft. from W. branch Croton	....	....	....	D. Hawley...............	Carmel	
575	sd	pv	vh	100 ft. from W. branch Croton	....	....	....	J. Garrison..............	Carmel	
576	sd	b	vh	100 ft. from W. branch Croton	2	....	....	R. Garrison	Carmel	Fifty feet from small brook.
577	fh	b by	h	250 feet from W. br. Croton.	2	1	1	E. Whitaker..............	Carmel	Barn five feet from small brook.
578	d	b	vh	250 feet from W. br. Croton.	1	1	....	Capt. Deane..............	Carmel	Twenty-five feet from small brook.
579	sd	pv	s	100 feet from Lake Gilead..	....	....	....	F. Smith	Carmel	
580	fh	b by	h	250 feet from Lake Gilead..	5	2	....	L. Dean..................	Carmel	
581	fh	b by	h	200 feet from Lake Gilead..	6	2	....	Mr. Wixon...............	Carmel	
582	fh	b by	h	700 feet from W. br. Croton.	4	1	4	A. Rice....	Carmel	Fifty feet from small brook.
583	d	pv	s	100 feet from small brook ..	....	....	....	S. Mead	Carmel	
584	d	pv	s	100 feet from small brook ..	....	....	....	J. Mead..................	Carmel	
†585	fh	b by	h	100 feet from W. br. Croton.	18	2	3	F. Agor	Carmel	Saw-mill on bank; small brook drains barn-yard.
586	fh	b by	h	100 feet from W. br. Croton.	18	2	....	J. Wilson	Carmel	Fifty feet from small brook.
†587	fh	b by	h	On small brook	...	....	....	....	Carmel	Brook drains barn-yard.
†588	fh	b by	h	On small brook	15	2	....	A. Craft..................	Carmel	Brook drains barn-yard.
589	fh	b by	h	200 feet from brook	4	1	....	Mrs. Barrett.............	Carmel	
590	fh	b by	s	50 feet from small brook ...	10	3	....	C. Ganong...............	Carmel	

January 5, 1885.

591	d	b	s	100 feet from W. br. Croton.	2	....	....	P. McCue	Carmel	
592	fh	b by	h	200 feet from W. br. Croton.	21	3	....	W. H. Ballard	Carmel	
593	fh	b by	vh	300 feet from W. br. Croton.	10	2	....	Mr. Leed.................	Carmel	
594	fh	b by	s	100 feet from Long pond bk.	5	1	2	R. W. Kelley............	Carmel	

TABLE III — West Branch of Croton River — (*Continued*).

Number.	Houses.	Outbuildings.	Elevation.	Distance.	Cows.	Horses.	Pigs.	Owner.	Town.	Remarks.
595	d	b	s	100 feet from Long pond bk.	1	....	1	Mrs. Graham............	Carmel	
596	fh	b by	s	200 feet from Long pond bk.	17	2	....	Mrs. Graham............	Carmel	Barn-yard fifty feet from small brook.
597	3 sd	b	s	100 feet from Long pond bk.	....	1	....	J. Wixon	Carmel	Fifty feet from drain.
598	dm	b	s	50 feet from Long pond bk.	2	2	....	D. H. Sunderline	Carmel	Saw-mill.
†599	fh	b by	h	50 feet from Long pond bk.	10	2	....	B. Secor	Carmel	Barn and barn-yard on opposite side of road; small drain runs through barn-yard.
†600	dm	b by	h	50 feet from Long pond bk.	2	....	....	W. Smith	Carmel	Saw-mill; privy five feet from brook; barn on bank; barn-yard drains into brook.
601	d	b	h	50 feet from Long pond bk.	7	....	....	B. F. Crane.............	Carmel	
602	d	b	s	25 feet from Long pond bk.	2	....	....	B. Secor	Carmel	Blacksmith shop on bank of brook; privy five feet from brook.
603	fh	b by	s	100 feet from Long pond bk.	6	1	2	D. W. Chace	Carmel	
604	fh	b by	s	50 feet from brook	12	2	....	J. L. Green	Carmel	
605	fh	b by	h	700 feet from Long pond bk.	26	3	....	H. Cole	Carmel	
606	d	pv	s	100 feet from brook	....	....	....	H. Cole	Carmel	
607	fh	b by	h	500 feet from Long pond....	9	2	....	Mrs. I. Barrett	Carmel	One hundred feet from brook.
608	d	b	h	150 feet from Long pond....	....	1	....	C. Townsend............	Carmel	Fifty feet from small brook.
609	fh	b by	h	150 feet from Long pond....	6	2	....	H. Ames	Carmel	Twenty-five feet from small brook; barn and barn-yard five feet from brook.
610	2 sd	b	s	100 feet from Long pond....	2	....	...	A. Adams	Carmel	
611	sd	b	s	50 feet from brook	2	....	....	J. Barrett................	Carmel	
612	fh	b by	s	150 feet from brook	6	1	....	G. Barrett	Carmel	
613	sd	pv	h	100 feet from Adams pond..	....	....	...	D. Brewer	Carmel	Pond discharges into Long pond.
614	fh	b by	h	50 feet from brook	11	....	....	E. Hopkins..............	Carmel	
615	fh	b by	h	50 feet from brook	14	2	2	J. H. Reed...............	Carmel	
†616	fh	b by	h	50 feet from brook	25	2	....	E. H. Ganong	Carmel	Brook drains barn-yard.
				January 7, 1885.						
617	......	......	h	On bank of Lake Gleneida.	...	....	...	....	Carmel	Village of Carmel; population, 500; surface drainage into lake. See sketch, Plate IV.
	sh	......	....	25 feet from Lake Gleneida.	....	....	....	....	....	School; privy ten feet from lake.
	*st	b	....	10 feet from Lake Gleneida.	....	4	....	M. Murphy	....	Flour and feed store and livery stable; manure pit drains into lake.
	sh	pvs	h	200 ft. from Lake Gleneida.	....	....	....	....	....	Drew Seminary.

	2 d	b		25 feet from Lake Gleneida.		2		Dr. F. H. Miller		Barn fifteen feet from lake.
	d	pv		25 feet from Lake Gleneida.				J. G. Miller		
	d	b		25 feet from Lake Gleneida.		1		A. Townsend		Barn on bank.
	*sd	pv		25 feet from Lake Gleneida.				G. Calhoun		Privy five feet from lake.
	d	pv		25 feet from Lake Gleneida.				H. Taylor		
	d	pv		25 feet from Lake Gleneida.				J. D. Little		
	d	b		25 feet from Lake Gleneida.				T. R. Ganong		Barn ten feet from lake.
	2 d	b		25 feet from Lake Gleneida.				J. M. Merritt		Barn on bank of lake.
	st d	b		25 feet from Lake Gleneida.		1		N. P. Barnes		Barn on bank of lake.
	†h	b		25 feet from Lake Gleneida.		4		D. Lockwood		Gleneida hotel; fifty guests; barn on bank; liquid filth runs into lake.
	3st			75 feet from Lake Gleneida,				B. S. Palmer		Block of three stores,
	3sd	pv		50 feet from Lake Gleneida,				Forshay, Meniert, Sickels		
	d	pv		75 feet from Lake Gleneida,				Mrs. Raymond		
	ld	b	h	250 ft. from Lake Gleneida,		3		Mrs. Raymond		
	d	b	h	150 ft. from Lake Gleneida.				Mrs. Raymond		
	fh	b by	h	250 ft from Lake Gleneida,	10	3		C. W. Lewis		
	d	pv	s	200 ft. from Lake Gleneida,				C. W. Lewis		200 feet from outlet of lake.
	d	b	s	50 feet from brook	2	1		T. Cole		
	*fh	b by	h	250 ft. from Lake Gleneida,	3	2		C. R. Weeks		
	d	pvs	s	15 feet from Lake Gleneida.				J. Shields		
	*d	b	s	15 feet from Lake Gleneida,	1			M. Malone		
	*d	pv	s	15 feet from Lake Gleneida,				Mrs. Logan		
	†d	pv		On bank of Lake Gleneida.				N. Y. and N. R. R.		No privy; excrem't & filth thro'n into lake.
	d			50 feet from Lake Gleneida,				N. Y. and N. R. R.		R. R. depot.
618	fh	b by	h	200 ft. from Horse Pound b'k	20	4	3	Mrs. Cornish	Carmel	
619	fh	b by	s	100 ft. from Horse Pound b'k	25	2	3	H. Travis	Carmel	
620	fh	b by	h	200 feet from W. br. Croton.	20	2		Mrs. J. Travis	Carmel	
621	d	b by	s	200 ft. from Horse Pound b'k	7	2		Mrs. J. Travis	Carmel	
622	d	b by	s	100 ft. from Horse Pound b'k				H. Travis	Carmel	
623	fh	pv	h	800 feet from Pine Pond b'k	20	3	2	D. Northrop	Kent	Barnyard 100 feet from small brook.
624	h	b by	h	150 feet from Pine Pond b'k	4	2	3		Kent	County Poor-house.
625	fh	b by	h	300 feet from Pine Pond b'k	5	2	3	W. Northrop	Kent	
626	fh	b by	h	100 feet from Pine Pond b'k	10	2	1	H. Tompkins	Kent	Barn and barn-yard fifty feet from brook.
627	d	pv	vh	400 feet from Pine Pond b'k				D. Ferris	Kent	
628	sd	pv	h	300 feet from Pine Pond				A. Ferris	Kent	
629	fh	b by	s	50 feet from brook	10			J. Smalley	Kent	
630	fh	b by	h	100 feet from brook	3	2		E. Smalley	Kent	
631	fh	b by	vh	300 feet from brook	3	2		K. Hopkins	Kent	
†632	fh	b by	s	50 feet from brook	4	3		T. Smalley	Kent	Brook drains barn-yard.

January 8, 1885.

633	fh	b by	s	100 feet from brook	20	2	3	C. Hughson	Carmel	
634	fh	b by	s	200 feet from brook	10	2	2	A. Colwell	Kent	
635	fh	b by	h	100 ft. from Horse Pound b'k	15	2	3	L. Nichols	Kent	
†636	fh	b by	h	100 feet from brook	25	6	5	D. R. Nichols	Kent	Small drain from barn-yard.
637	fh	b by	h	100 feet from brook	10	2	2	T. Hazen	Kent	

TABLE III — West Branch of Croton River — (*Continued*).

No.	Houses.	Outbuildings.	Elevation.	Distance.	Cows.	Horses.	Pigs.	Owner.	Town.	Remarks,
638	fh	b by	s	50 feet from brook	20	2	...	D. R Nichols	Kent	
639	sd	pv	s	100 feet from Dean's pond	....	....	....	J. Birch	Kent	
640	fh	b by	s	50 ft. from Horse Pound b'k	20	2	...	N. Kent	Kent	
641	sd	pv	s	100 feet from brook	....	....	....	Dr. F. H. Miller	Kent	
†642	fh	b by	s	50 feet from two brooks	25	2	....	Dr. F. H. Miller	Kent	Small brook drains barn-yard.
643	fh	b by	s	75 feet from brook	3	1	...	Mrs. Colwell	Kent	
644	fh	b by	h	100 ft. fr. Horse Pound br'k.	6	1	2	...	Kent	Fifty feet from small brook.
645	fh	b by	h	100 ft. fr. Horse Pound br'k.	10	2	3	E. Turner	Kent	
646	sd	pv	h	50 feet from branch	....	....	....	W. Kent	Kent	
647	fh	b by	vh	100 feet from branch	25	3	5	W. Kent	Kent	Barn and barn-yard 50 feet from branch.
648	d	pv	h	150 feet from branch	....	....	....	W. Kent	Kent	
649	d	pv	s	100 feet from branch	....	....	....	G. Baker	Kent	
650	fh	b by	s	50 feet from branch	3	1	....	A. Hyatt	Kent	
651	sd	pv	s	100 feet from branch	...	....	....	W. Hyatt	Kent	
652	fh	b by	s	50 feet from branch	25	2	4	E. Wickson	Kent	
653	fh	b by	h	75 feet from branch	....	....	....	C. Robinson	Kent	
654	fh	b by	s	50 feet from branch	...	....	....	E. Robinson, est	Kent	Privy ten feet from brook.
655	fh	b by	s	75 feet from branch	20	2	....	Mrs. Robinson	Kent	
656	fh	b by	h	300 feet from branch	18	3	....	E. J. Wixon	Kent	
657	fh	b by	s	50 feet from branch	15	1	....	T. Kent	Kent	
658	fh	b by	s	50 feet from branch	21	2	....	J. Robinson	Kent	
								January 9, 1885.		
659	fh	b by	h	500 ft. fr. Horse Pound br'k.	20	2	4	C. Smith	Carmel	500 feet from West branch Croton.
660	fh	b by	h	400 feet from W. br. Croton.	25	2	3	N. D. Shaw	Carmel	Barn and barn-yard on opposite side of road, twenty-five feet from small brook.
661	fh	b by	h	350 feet from W. br. Croton.	15	2	2	G. Smalley	Carmel	Barn and barn-yard on opposite side of road, ten feet from small brook.
662	d	b	h	300 feet from W. br. Croton.	1	....	2	M. Cusick	Carmel	
663	fh	b by	h	500 feet from W. br. Croton.	25	3	2	F. Haight	Kent	Barn-yard ten feet from small brook.
664	fh	b by	h	300 feet from W. br. Croton.	9	2	2	S. Townsend	Kent	House and privy 25 feet from small brook.
665	sh	pv	h	200 feet from W. br. Croton.	....	...	....	.....	Kent	School-house.
666	d	pv	s	25 feet from W. br. Croton.	...	....	....	J. Smalley	Kent	
†667	d m	......	....	On bank of W. br. Croton	....	....	....	L. Post	Kent	Saw-mill: portion of house over river; no privy; excrement and filth probably thrown into river.

†668	fh	b by	s	50 feet from W. br. Croton..	12	2	....	T. Cole..................	Kent	Barn-yard ten feet from river and drains into it.
669	fh	b by	h	100 feet from W. br. Croton.	17	2	9	C. B. Nichols	Kent	Twenty feet from small brook.
670	d	b by	h	200 feet from W. br. Croton.	1	...	....	W. Bennett	Kent	Twenty-feet from small brook.
671	fh	b by	h	200 feet from brook	18	2	2	T. F. Cole................	Kent	
672	fh	b by	h	300 feet from brook	4	....	3	S. Barrett	Kent	
673	fh	b by	s	150 feet from Barrett's pond	4	....	2	W. Barrett...............	Kent	
674	sd	pv	s	50 feet from Barrett's pond.	....	....	...	P. Barrett	Kent	
675	fh	b by	s	Near Barrett's pond........	....	....	....	G. Barrett	Kent	
676	sd	b by	s	250 feet from Barrett's pond	5	....	....	J. L. Barrett.............	Kent	
677	fh	b by	h	500 feet from China pond...	18	2	3	W. Beacon...............	Kent	
678	fh	b by	h	250 feet from W. br. Croton.	13	2	3	W. Hopkins	Kent	Twenty-five feet from small brook.
679	sd	pv	h	200 feet from W. br. Croton.	....	....	....	B. Cargin.................	Kent	
680	sd	pv	s	75 feet from W. br. Croton..	....	....	...	P. Sutton	Kent	
681	d	b	h	100 ft. from W. br. Croton...	....	1	....	O. Likely.................	Kent	
682	d	b	h	100 ft..from W. br. Croton...	3	1	....	Dept. Public Works.....	Kent	
683	fh / sd	b by / pv	h / s	300 feet fr. W. br. Croton. / 50 feet fr. W. br. Croton..	12	4	.. .	H. Stephens.............	Kent	
684	st	pv	s	50 feet from W. br. Croton.	....	....	....	A. Townsend............	Kent	Grocery.
685	st	pv	s	50 feet from W. br. Croton.	....	....	....	J. Bennett................	Kent	Grocery.
686	fh	b by	h	75 feet from W. br. Croton.	5	5	3	J. Bennett................	Kent	
†687	fh	b by	h	500 feet from brook..........	25	5	3	M. Stephens.............	Kent	Small drain from barn-yard.
688	fh	b by	h	25 feet from small brook....	5	1	1	G. Randall................	Kent	

January 10, 1885.

689	fh	b by	h	100 feet from W. br. Croton.	12	2	....	J. O. Bailey..............	Kent	
690	fh	b by	h	100 feet from small brook...	10	2	....	S. Parker	Kent	
691	fh	b by	h	300 feet from brook..........	3	1	....	J. Rockwood.............	Kent	
692	fh	b by	h	150 feet from brook..........	6	2	3	N. Parker.................	Kent	
693	fh	b by	h	250 feet from brook..........	12	2	2	N. Barrett................	Kent	Small brook through premises.
694	......	......	h	500 feet from brook	....	....	....	....	Kent	Farmers Mills, population 75; small stream runs through village; surface drainage running into it: covered, nothing discharged into it.
......	m	......	....	On small brook.............	....	....	....	B. Tompkins.............	....	Saw mill.
......	m	......	....	On small brook	....	....	....	Hopkins & Drew........	....	Cider and grist mill.
695	fh	b by	h	100 feet from Forge pond...	10	2	3	J. White..................	Kent	
696	sd	pv	s	25 feet from Forge pond....	....	....	....	J. Wixon..................	Kent	Privy ten feet from pond.
697	cg	......	h	200 feet from Forge pond...	....	....	....	....	Kent	M. E. church and cemetery.
698	sd	pv	h	100 feet from small brook...	....	...	....	J. Kirk....................	Kent	
699	sd	pv	h	150 feet from brook	....	....	....	J. Bolltes	Kent	
700	sd	......	s	50 feet from White pond....	...	....	...	E. Merritt................	Kent	No privy.
701	d	b	s	100 feet from White pond...	....	....	...	W. Mead..................	Kent	
702	sd	pv	s	100 feet from White pond...	....	....	....	W. Mead..................	Kent	
703	sd	pv	s	150 feet from White pond...	....	....	....	W. Mead..................	Kent	
704	fh	b by	h	75 feet from White pond....	70	2	3	C. & E. Mead	Kent	
705	sd	pv	h	100 feet from White pond...	....	....	....	C. & E. Mead	Kent	Now gone.
706	d	b	h	100 feet from brook..........	2	....	....	C. Smalley...............	Kent	

TABLE III — West Branch of Croton River — (*Continued*).

Number.	Houses.	Outbuildings.	Elevation.	Distance.	Cows.	Horses.	Pigs.	Owner.	Town.	Remarks.
707	d	b	s	50 feet from brook	1			W. Smalley	Kent	
708	fh	b by	s	75 feet from brook	12	2	2	D. Wright	Kent	
709	d	b	h	150 feet from brook	3	1		W. Ladue	Kent	
710	fh	b by	h	100 feet from brook	10	2		T. Dean	Kent	
711	fh	b by	h	200 feet from brook	6	2		P. Lockwood	Dutchess Co.	
712	fh	b by	s	75 feet from brook	20	2		F. Smalley	Dutchess Co.	
713	d	b	h	150 feet from brook		1		J. Smalley	Dutchess Co.	
714	sd	pv	s	50 feet from brook				J. Palmerlie	Dutchess Co.	
715	fh	b by	s	75 feet from brook	20	2		W. Mead	Dutchess Co.	
716	fh	b by	h	800 feet from brook	22	3		C. Wright	Dutchess Co.	
717	fh	b by	h	100 feet from small brook	20	2		Mrs. Smalley	Kent	
718	fh	b by	h	100 feet from brook	8	1	2	A. B. Smalley	Kent	
719	fh	b by	s	100 feet from brook	2	1		J. Smalley	Kent	

January 12, 1885.

Number.	Houses.	Outbuildings.	Elevation.	Distance.	Cows.	Horses.	Pigs.	Owner.	Town.	Remarks.
720	m		s	50 feet from W. br. Croton				J. Bennett	Kent	Blacksmith shop and saw-mill; water conveyed in trough and discharged into river.
721	sd	pv	h	75 feet from W. br. Croton				J. Bennett	Kent	
722	c	pv	h	75 feet from W. br. Croton					Kent	Small church.
723	d	b	h	75 feet from W. br. Croton		3		A. Williams	Kent	
724	sd	pv	h	50 feet from W. br. Croton				D. Williams	Kent	
725	sh	pv	h	100 feet from W. br. Croton					Kent	District school.
726	fh	b by	s	50 feet from Black Pond b'k	7	2	2	E. Merritt	Kent	Carriage-house on bank.
†727	h	b by	s	75 feet from Black Pond b'k	2			E. Merritt	Kent	Small drain from barn-yard.
728	d	b	h	150 feet from Black Pond b'k		1		B. Halstead	Kent	
729	g		h	250 feet from Black Pond b'k					Kent	Cemetery; 500 bodies.
730	fh	sb	s	50 feet from Black Pond b'k	15	2	2	S. P. Mead	Kent	Privy and barn-yard ten feet from brook.
731	d	pv	h	100 feet from Black Pond b'k				W. Mead	Kent	
732	sd	pv	h	300 feet from Black Pond b'k				G. McDonald	Kent	Now gone.
733	fh	b by	h	400 feet from Black Pond b'k	10		2	D. Knapp	Kent	100 feet from small brook.
734	fh	b by	h	300 feet from Black Pond b'k	10	2	2	P. Wright	Kent	
†735	fh	b by	vh	800 feet from Black Pond b'k	16	2	3	S. Sprague	Kent	Small drain from barn-yard.
736	d	b	h	100 feet from Black Pond b'k				E. Ridgeway	Kent	
737	fh	b by	s	200 feet from Black Pond b'k	2	1		J. Brewer	Kent	
738	fh	b by	h	300 feet from Black Pond b'k	5	2		D. Wright	Dutchess Co.	
739	fh	b by	vh	1,200 ft. from Black Pond b'k	16	2		J. Smalley	Dutchess Co.	

740	fh	b by	h	500 ft. from West br. Croton	12	2	3	J. Forshay	Kent	100 feet from brook.
741	d	b	h	500 ft. from West br. Croton	....	....	....	W. Bennett	Kent	50 feet from brook.
742	fh	b by	h	500 ft. from West br. Croton	6	2	....	H. Light	Kent	
743	fh	b by	h	100 feet from brook	7	....	2	I. Knapp	Kent	
744	d	pv	h	300 feet from brook	....	....	....	I. Booth	Kent	
745	fh	b by	s	100 feet from brook	6	2	....	J. Rickey	Philipstown	
746	fh	b by	s	100 feet from brook	12	1	....	R. Horton	Philipstown	
747	fh	b by	s	100 feet from brook	5	2	....	Mrs. Dean	Philipstown	
748	fh	b by	h	500 ft. from West br. Croton	6	2	2	J. Hulse	Kent	
749	d	b	h	50 feet from small brook	1	....	....	Mrs. Smalley	Kent	
750	sd	b	s	100 feet from brook	2	....	....	J. D. Bennett	Putnam Val'y	
751	d	b	h	150 feet from brook	10	1	....	J. Bennett	Putnam Val'y	
752	d	b	s	15 feet from brook	3	2	....	D. Bennett	Putnam Val'y	

TABLE III — Summary — (*Continued*).

	Croton river.	Cross river.	Beaver Dam brook.	Muscoot river.	Plum brook.	Titicus river.	East Branch Croton river.	Middle Branch Croton river.	West Branch Croton river.	Totals.
Houses and privy vaults	152	154	114	89	23	106	755	180	306	1,879
Barns and barnyards	47	10	58	22	10	24	182	107	142	602
Cows	856	86	460	374	294	367	3,677	1,523	1,801	9,438
Horses	86	14	159	47	37	46	472	183	240	1,284
Pigs	91	12	81	86	48	102	649	278	154	1,501
Sheep	20	....	....	....	....	....	....	....	...	20
Saw and grist-mills	1	1	1	4	....	1	11	7	4	30
Cemeteries	1	1	....	....	....	....	1	....	2	5
Blacksmith shops	2	....	1	2	....	1	11	1	1	19
Cider mills	....	1	....	....	....	1	....	1	....	3
Iron mines	....	....	....	....	....	....	....	2	....	2
Carriage factories	....	1	1	....	....	....	....	1	....	3
Slaughter-houses	....	1	...	....	....	....	3	....	....	4
Condensed milk factories	1	....	....	....	....	....	1	....	....	2
Tanneries	....	....	....	....	....	....	1	....	....	1
Cement factories	....	....	....	....	....	....	1	....	....	1
Woolen mills	....	....	....	....	....	1	....	....	....	1
Machine shops	1	....	....	....	....	....	....	....	....	1

Total number of square miles in Croton watershed 339
Population of Croton watershed, about 20,000

B. Inspection for State Board of Health — Tabular Statement.

The following, Table IV, is a tabular statement of the results of our inspection during the summer of 1888. The first two columns give the number of houses and out-buildings located on the water-shed of each stream. The last two columns give the number of houses and out-buildings on each water-shed which deserve mention as sources of pollution from their proximity to the streams or from the facility with which the drainage therefrom could enter the streams. These latter correspond in character to those described in Mr. Lucas' report, preceding. The arrangement of the table is geographical and the order of procedure will be easily determined by reading the main headings. Under each main heading, the streams flowing into the main stream under consideration are numbered in the order of their entrance into the main stream, beginning at the lower (down stream) end. When such a tributary of the main stream has

several tributaries of its own, they are distinguished by the small letters *a*, *b* and *c*, the, order being as before that of their entrance into the larger tributary, beginning at the lower end.

The totals of each main heading are brought together in the summary and a grand total is obtained. Following this is a summary by towns, which gives the numbers in each town and county on the water-shed. In this summary a column is added which gives the number of cemeteries in each town. Then follows a table giving the numbers in each village or collection of houses large enough to have a name.

It will be observed that the total number of houses deserving special mention is 2,843, while the number in the report of Mr. Lucas is 1,879. The difference is due to two causes, the first that our inspection covers the entire water-shed, while his omits a part, as will be seen by following the numbers of his inspections on the map; the second is that there has been some increase of population in the interval between the reports. It happens that the greatest increase of population is at Yorktown railroad station, and in Bedford, in the neighborhood of Mt. Kisco, both of which were omitted from his report. The number of out-buildings is also much greater than the number of barns and barn-yards in his report. This is due to the attempt on our part to give the number of out-buildings in connection with each house. In the absence of a detailed statement of the number of animals, which we had not time to get, this will give an idea of the amount of business done on each farm. With reference to the number of domestic animals it may be mentioned that Mr. Lucas' report gives the number of animals pertaining to 1,879 houses as 12,243, including cows, horses, pigs and sheep, or an average of 6.5 animals to each house. A consideration of the area covered by his inspection, as indicated upon the map, Plate I, by the numbers of the items in his report, will justify the belief that this average would apply to the entire water-shed, which would make the number of domestic animals pertaining to houses requiring special

attention about 18,500, and the total number on the water-shed about 33,000. It is my opinion that this is an under, rather than an over-estimate of the number of animals upon the water-shed at the present time.

The total number of square miles in the water-shed of the new reservoir is 361.82. The present population on this area is about 25,000. The population in any portion desired can be obtained approximately by multiplying the total number of houses on that portion by five.

TABLE IV.

Inspection of Croton Water-shed — State Board of Health.

		Total.		Require Special Attention.	
		Houses.	Outbuildings.	Houses.	Outbuildings.
A. Croton river, from site of Quaker Bridge dam to Croton dam, south side:					
Into river direct	Cortlandt	2	7	2	7
Into river direct	Yorktown	8	8	8	7
I	Cortlandt	4	3	2	2
I	Yorktown	10	19	3	3
II	Yorktown	......	8	......	8
III	Yorktown	2	2	......	......
IV	....	......	......	......	......
V	Yorktown	17	18	8	9
V	Newcastle	5	5	1	1
V*a*	Yorktown	5	3	2	......
V*b*	Yorktown	5	8	4	6
Totals		58	81	30	43
Will be drowned by new reservoir		......	......	12	29
B. Croton river, from site of Quaker Bridge dam to Croton dam, north side:					
Into river direct	Cortlandt	1	......	......	......
Into river direct	Yorktown	10	9	10	9
I	Cortlandt	7	5	1	2
II	Cortlandt	12	12	6	1
III	Cortlandt	9	9	5	7
III	Yorktown	19	29	9	10
III*a*	Cortlandt	11	22	4	2
III*b*	Yorktown	5	10	2	3
III*c*	Yorktown	4	3	2	......
III*d*	Yorktown	1	3	1	3
III*e*	Yorktown	3	9	......	......
III*f*. (West branch from pond)	Yorktown	13	11	5	6
III*f*	Cortlandt	9	15	4	9
III*g*. (East branch from pond)	Yorktown	38	80	12	25
IV	Yorktown	12	26	7	17
IV*a*	Yorktown	11	20	7	13
V	Yorktown	7	15	5	11
VI	Yorktown	4	16	3	12
VII	Yorktown	1	1	1	1
Totals		177	295	84	131
Will be drowned by new reservoir		......	......	35	38
C. Croton river, from Croton dam to Cross river, south side:					
Into river direct	Yorktown	25	22	20	29
Into river direct	Lewisboro	1	......	1	......
Into river direct	Newcastle	2	2	2	2
Into river direct	Bedford	6	7	......	......
I	Yorktown	13	14	11	6
II	Yorktown	7	5	5	5
II	Newcastle	19	20	1	2
II*a*	Yorktown	17	7	9	6
II*b*	Newcastle	6	5	4	3
III	Yorktown	2	3	......	......
III	Newcastle	13	18	4	5
III*a*	Yorktown	1	1	1	1
III*b*	Newcastle	6	11	5	5
III*c*	Newcastle	3	14	2	8
IV	Yorktown	10	3	10	3
V, Kisco river	Newcastle	69	39	33	27

TABLE IV — (*Continued*).

		Total.		Require Special Attention.	
		Houses.	Outbuildings.	Houses.	Outbuildings.
C. Croton river, from Croton dam to Cross river, south side—(Continued):					
V	Bedford	1	1	......	......
V*a*	Newcastle	1	2	1	2
V*b*	Bedford	11	11	7	7
V*c*	Newcastle	2	6	2	5
V*c*	Yorktown	2	1	2	1
V*d*	Newcastle	19	21	9	20
V*d*	Yorktown	2	8	......	......
V*e*. (Part of Mt. Kisco inc. in next line)	Newcastle	......	......	......	......
V*e*	Bedford	248	180	125	95
V*f*	Newcastle	21	11	10	6
V*g*	Newcastle	20	22	15	15
V*h*	Newcastle	14	8	3	5
V*i*	Newcastle	15	29	14	28
V*j*	Newcastle	10	5	3	2
V*j*	Bedford	8	7	7	6
V*k*	Bedford	30	23	23	13
VI	Bedford	10	24	6	13
VII and VIII	Bedford	3	7	3	7
IX	Bedford	2	4	2	4
X	Bedford	8	16	3	6
Totals		618	557	343	337
Will be drowned by new reservoir		......	......	13	12
D, Croton river, from Croton dam to Muscoot river, north side:					
Into river direct	Yorktown	11	25	10	23
Into river direct	Somers	7	8	5	7
I	Yorktown	3	2	3	2
II	Yorktown	45	27	23	19
III	Yorktown	8	20	5	13
IV	Yorktown	18	31	6	10
IV	Somers	7	10	2	1
V	Somers	2	....	2	....
VI	Somers	13	15	10	11
VII	Somers	4	4	3	3
Totals		118	142	69	89
Will be drowned by new reservoir		......	......	19	23
E. Cross river, south side:					
Into river direct (p'rt of Katonah included in next line)	Lewisboro	32	26	21	13
Into river direct	Bedford	38	47	32	42
Into river direct	Poundridge	11	12	8	7
I. Beaver Dam brook	Bedford	13	17	9	12
I*a*	Bedford	5	13	3	11
I*b*	Bedford	87	73	27	15
I*c*. Broad brook (of Westchester Co.)	Bedford	76	83	33	45
I*d*	Bedford	4	13	2	8
I*e*. Davis brook	Bedford	53	50	14	27
I*f*. Stonehill river	Bedford	45	70	16	32
I*f*	Poundridge	23	30	11	18
II	Bedford	11	9	4	7
III	Bedford	3	3	1	1
IV	Bedford	8	10	5	7
IV*a*	Bedford	9	16	3	5
IV*a*	Poundridge	4	5	1	3
V	Lewisboro	2	3	2	3

TABLE IV — (*Continued*).

		Total. Houses.	Total. Outbuildings.	Require Special Attention. Houses.	Require Special Attention. Outbuildings.
E. Cross river, south side — (Continued):					
VI	Lewisboro	6	7	3	7
VI	Poundridge	12	9	9	8
VII	Poundridge	12	16	2	2
Totals		454	512	206	273
Will be drowned by new reservoir		......	......	11	18
F. Cross river, north side:					
Into river direct (p'rt of Katonah included in next line)	Lewisboro	27	23	6	3
Into river direct	Bedford	73	52	41	23
Into river direct	Poundridge	2	1	2	1
I	Bedford	7	13	2	3
I	Lewisboro	3	1	1	....
II	Bedford	2	1	2	1
III	Bedford	9	8	3	4
IV	Bedford	6	9	4	4
V	Lewisboro	32	28	28	18
V*a*	Lewisboro	2	2	1	2
V*a*	Bedford	9	19	4	
V*b*	Lewisboro	7	8	1	....
VI. Waccabuc river	Poundridge	5	2	5	2
VI	Lewisboro	22	26	10	9
VI*a*	Lewisboro	2	4	2	3
VI*b*	Lewisboro	6	19	3	9
VI*c*	Lewisboro	1	3	1	2
VI*d*	Lewisboro	35	51	9	18
VI*e*	Lewisboro	2	5	1	3
VI*f*	Lewisboro	8	6	3	5
VI*g*	Lewisboro	3	4	3	4
VII	Lewisboro	41	33	11	10
VII	Poundridge	4	3	3	3
Totals		308	321	146	134
Will be drowned by new reservoir		....	....	25	27
G. Muscoot river, west side:					
Into river direct	Somers	53	53	23	24
Into river direct	Carmel	24	42	3	4
I	Somers	6	2	2	2
II	....	......	......	......	....
III	Yorktown	13	23	12	16
III	Somers	10	16	4	3
III*a*	Somers	3	4	3	4
III*b*	Somers	5	5	2	3
III*c*	Yorktown	1	1	....	....
III*d*	Yorktown	13	9	1	3
III*e*. Mohansic lakes	Yorktown	40	70	22	39
III*f*	....	......	......	......	....
III*g*	Yorktown	6	8	3	3
III*h*	Yorktown	2	2	2	2
IV	Somers	17	18	3	5
V	Carmel	1	4	1	4
VI	Carmel	19	24	7	14
VI*a*	Carmel	8	17	1	1
VI*b*	Carmel	7	8	5	4
VI*b*	Putnam Valley	7	10	2	2
VI*c*	Putnam Valley	4	16	2	8
VI*d*	Putnam Valley	2	5	2	5

TABLE IV — (*Continued*).

		Total.		Require Special Attention.	
		Houses.	Outbuildings.	Houses.	Outbuildings.
G. Muscoot river, west side — (Continued):					
VII	Carmel	16	25	10	15
VIII	Carmel	20	18	13	11
Totals		277	380	123	172
Will be drowned by new reservoir		......	......	1	......
H. Muscoot river, east side:					
Into river direct	Somers	32	33	24	26
Into river direct	Carmel	16	4	3	1
I	Somers	9	20	4	12
I*a*	Somers	12	15	5	7
I*b*	Somers	3	10	3	9
II	Somers	1	4	1	4
III	Somers	22	26	8	6
III	Carmel	2	5	......	......
IV	Somers	2	5	2	5
IV	Carmel	4	4	1	......
V	....	....	......	......	......
VI	Carmel	14	19	6	9
VI*a*	Carmel	4	6	3	6
VII. Lake Mahopac	Carmel	49	27	40	14
Totals		170	178	100	99
K. Croton river, from Cross river to West Branch, east side:					
Into river direct	Lewisboro	18	19	9	12
Into river direct	North Salem	24	19	21	14
I	Lewisboro	21	34	9	17
I*a*	Lewisboro	2	5	1	3
I*b*	Lewisboro	10	1	7	......
I*c*	Lewisboro	3	6	2	5
I*d*	Lewisboro	2	1	2	1
II	Lewisboro	36	31	16	16
III	North Salem	16	23	9	12
III*a*	North Salem	2	1	1	......
III*a*	Lewisboro	5	11	4	9
IV	North Salem	2	3	2	3
V. Titicus river	North Salem	195	171	131	111
V*a*	North Salem	1	2	1	2
V*b*	North Salem	1	1	1	1
V*c*	North Salem	1	1	1	1
V*d*	North Salem	1	2	1	2
V*e*	North Salem	1	4	1	4
V*f*	North Salem	11	12	5	3
V*g*	North Salem	12	24	3	7
V*g*	Lewisboro	5	5	3	2
V*h*	North Salem	5	7	4	7
VI	North Salem	11	19	6	12
....	Southeast	6	3	......	2
Totals		391	405	240	246
Will be drowned by new reservoir		......	......	71	35
L. Croton river from Muscoot river to West Branch, west side:					
Into river direct	Somers	4	6	1	2
I Plum brook	Somers	36	43	10	12
I	Carmel	3	1	1	1
I*a*	Somers	61	50	23	30
I	Carmel	9	13	6	8
I*b*	Somers	1	2	1	2
I*c*	Somers	23	17	6	4

TABLE IV — (*Continued*).

		Total.		Require Special Attention.	
		Houses.	Outbuildings.	Houses.	Outbuildings.
L. Croton river from Muscoot river to West Branch, west side — (Continued):					
I*d*	Somers	8	5	8	5
I*e*	Carmel	3	3	......	......
I*f*	Carmel	27	18	12	8
I*g*	Carmel	17	12	4	3
II	Somers	17	7	4	7
III	Somers	8	11	2	4
Totals		217	188	78	86
Will be drowned by new reservoir		......	......	3	2
M. East Branch of Croton river, east side:					
Into river direct	North Salem	80	85	30	46
Into river direct	Southeast	100	93	90	68
Into river direct	Patterson	16	45	10	32
Into river direct	Dutchess Co.	18	23	10	13
I	North Salem	6	11	1	1
I	Southeast	11	15	9	9
I*a*	Southeast	4	8	2	1
I*b*	Southeast	14	32	9	16
I*b*	North Salem	3	5	2	4
I*c*	North Salem	3	5	2	3
II	Southeast	3	4	3	4
III	Southeast	6	3	2	1
IV	Southeast	1	......	1	......
V. Peach lake	Southeast	10	12	8	12
V	North Salem	16	15	4	4
V*a*	Southeast	9	23	9	23
V*b*	North Salem	6	8	1	......
V*b*	Southeast	3	8	......	......
VI. Covill's brook	Southeast	11	14	11	14
VI*a*	Southeast	3	1	2	1
VI*b*	Southeast	8	21	4	9
VII	Southeast	2	2	2	2
VIII	Southeast	2	2	2	2
IX	Southeast	8	13	6	9
X	Southeast	19	28	10	15
XI. Daly brook	Southeast	11	29	10	28
XII	Patterson	18	23	5	5
XII*a*	Southeast	11	29	9	24
XII*b*	Patterson	3	7	1	6
XIII	Patterson	4	3	1	2
XIV	Patterson	3	3	3	3
XV. Quaker brook	Patterson	37	56	28	42
XV	Dutchess Co.	6	13	......	......
XVI	Patterson	3	8	3	8
XVII	Patterson	2	10	2	10
XVIII	Patterson	11	21	10	21
XIX	Patterson	5	9	5	9
XX	Dutchess Co.	3	8	1	3
XXI	Dutchess Co.	8	15	3	4
XXII	Dutchess Co.	1	3	......	......
XXIII	Dutchess Co.	1	3	......	......
XXIV	Dutchess Co.	4	7	2	1
Totals		493	723	313	455
N. East Branch of Croton river, west side:					
Into river direct	Somers	7	5	7	5
Into river direct	Carmel	2	......	2	......
Into river direct	Southeast	123	61	71	36
Into river direct	Patterson	20	29	8	11
Into river direct	Dutchess Co.	35	53	18	27

TABLE IV — (*Continued*).

		Total. Houses.	Total. Outbuildings.	Require Special Attention. Houses.	Require Special Attention. Outbuildings.
N. East Branch of Croton river, west side — (Continued):					
I	Southeast	5	3	2	3
II. Tonetta brook	Southeast	198	48	105	24
II*a*	Southeast	3	3	3	3
II*b*	Southeast	6	18	3	9
III. Mud pond	Southeast	38	62	16	37
III	Patterson	6	14	1	3
III*a*	Southeast	8	18	8	18
III*b*	Southeast	2	4	1	3
III*c*	Southeast	2	8	2	8
III*d*	Southeast	5	6	4	6
III*e*	Southeast	6	7	3	5
IV	Southeast	1	1	1	1
V	Southeast	1	2	1	2
VI	Patterson	2	4	1	2
VII	Patterson	1	3	1	3
VIII. Muddy brook	Patterson	42	38	18	18
VIII	Southeast	10	23	6	17
VIII*a*. Mill brook	Patterson	110	105	33	54
VIII*a*	Dutchess Co.	33	30	19	23
VIII*b*	Patterson	13	35	11	27
VIII*c*	Patterson	43	56	26	35
VIII*c*	Kent	2	3	1	1
VIII*d*	Patterson	8	2	6	2
VIII*e*	Patterson	2	6	2	6
VIII*f*	Patterson	2	7	2	7
VIII*g*	Patterson	2	4	2	4
VIII*h*	Patterson	15	18	11	14
IX	Dutchess Co.	15	27	......	....
IX*a*	Dutchess Co.	4	11	3	4
IX*b*	Dutchess Co.	1	6	......	....
X	Dutchess Co.	51	23	49	22
X*a*	Dutchess Co.	3	5	2	5
XI	Dutchess Co.	5	8	4	7
XII	Dutchess Co.	2	3	2	3
XIII	Dutchess Co.	3	9	2	4
XIV	Dutchess Co.	6	10	3	7
XV	Dutchess Co.	6	17	1	8
Totals		849	795	461	474
O. Middle Branch of Croton river, east side:					
Into river direct	Carmel	2	5	2	5
Into river direct	Southeast	46	28	43	24
Into river direct	Kent	28	27	26	21
Into river direct	Patterson	4	7	......	....
Into river direct	Dutchess Co.	17	23	1	2
I	Southeast	11	6	11	6
II	Southeast	11	16	10	13
III	Southeast	1	5	1	5
IV. Beaver brook	Patterson	11	18	9	11
IV*a*	Patterson	3	6	3	6
V	Kent	1	4	1	4
VI	Kent	2	3	2	3
VII	Kent	2	3	1	3
VIII	Kent	8	6	8	6
Totals		147	157	118	109
P. Middle Branch of Croton river, west side:					
Into river direct	Carmel	2	6	1	3
Into river direct	Southeast	19	32	10	26
Into river direct	Kent	19	19	10	13
Into river direct	Dutchess Co.	5	6	1	....

TABLE IV — (*Continued*).

		Total. Houses.	Total. Outbuildings.	Require Special Attention. Houses.	Require Special Attention. Outbuildings.
Middle Branch of Croton river, west side — (Continued):					
I	Southeast	4	10	2	4
I	Carmel	62	68	29	35
I	Kent	2	2	1	1
I*a*	Carmel	6	9	5	6
I*b*	Carmel	5	4	3	4
I*c*	Kent	6	6	3	5
II	Carmel	3	8	3	8
III	Kent	9	17	6	15
IV	Kent	1	2	1	2
V	Kent	1	1	1	1
VI	Kent	1	2	1	2
VII	Dutchess Co	21	14	11	7
VIII	Dutchess Co	10	10	5	3
IX	Dutchess Co	6	5	2	1
Totals		182	221	95	136
Q. West Branch of Croton river, east side:					
Into river direct	Somers	3	5	3	5
Into river direct	Carmel	29	37	10	18
Into river direct	Kent	17	11	11	11
Into river direct	Putnam Valley	......	3	....	3
Into river direct	Philipstown	2	2	2	2
I	Carmel	17	27	13	24
II. Lake Gilead	Carmel	5	7	5	7
III. Horse Pound brook	Carmel	6	8	6	8
III	Kent	19	25	7	18
III*a*. Pine pond and brook	Kent	17	19	13	15
III*b*. Lake Gleneida	Carmel	88	38	75	32
IIIc	Carmel	1	4	1	4
IIIc	Kent	13	24	7	15
III*d*	Kent	1	3	1	3
III*e*	Kent	5	7	2	5
III*f*	Kent	9	14	8	13
III*g*	Kent	4	6	3	6
IV	Kent	1	4	1	4
V	Kent	2	1	1	....
VI	Kent	5	9	4	8
VII	Kent	14	16	4	8
VII*a*. Forge and White ponds	Kent	31	28	27	22
VII*b*. Wright's brook	Kent	7	8	6	8
VII*b*	Dutchess Co	22	27	8	19
VIII. Black Pond brook	Kent	13	14	13	14
VIII	Dutchess Co	15	16	7	7
IX	Kent	5	7	3	4
X	Kent	2	3	2	3
XI	Philipstown	2	2	1	1
Totals		355	375	244	287
R. West Branch of Croton river, west side:					
Into river direct	Somers	1	2	......	......
Into river direct	Carmel	20	34	15	27
Into river direct	Kent	20	15	16	14
I	Somers	......	1	......	1
II. Broad brook (of Putnam county)	Carmel	75	61	72	52
II*a*	Carmel	3	12	1	4
II*b*	Carmel	9	9	5	6
II*c*	Carmel	2	5	2	5
II*d*	Carmel	11	18	8	14
II*e*	Carmel	1	4	......	1
II*f*	Carmel	6	7	4	4
III	Carmel	2	4	2	4
IV	Carmel	7	7	1	3
V	Carmel	3	5	3	5
VI. Long pond	Carmel	27	28	23	23
VI*a*	Carmel	3	11	3	10

TABLE IV — (*Continued*).

		Total.		Require Special Attention.	
		Houses.	Outbuildings.	Houses.	Outbuildings.
R. West Branch of Croton river, west side — (Continued):					
VI*b*	Carmel	10	13	6	4
VI*c*.	Carmel	2	3	2	3
VI*d*	Carmel	9	14	9	14
VII. Barrett's pond.	Kent	10	13	10	13
VIII. China pond	Kent	2	6	2	6
IX.	Kent	11	10	5	9
X.	Kent	2	......	......	......
X	Putnam Vall'y,	6	......	4	......
Totals		242	282	193	222

Summary.

	Total Houses.	Total Outbuildings.	Require Special Attention Houses.	Require Special Attention Outbuildings.
A. Croton river, from site of Quaker Bridge dam to Croton dam, south side	58	81	30	43
B. Croton river, from site of Quaker Bridge dam to Croton dam, north side	177	295	84	131
C. Croton river, from Croton dam to Cross river, south side	618	557	343	337
D. Croton river, from Croton dam to Muscoot river, north side	118	142	69	89
E. Cross river, south side	454	512	206	273
F. Cross river, north side	308	321	146	134
G. Muscoot river, west side	277	380	123	172
H. Muscoot river, east side	170	178	100	99
K. Croton river, from Cross river to West Branch, east side	391	405	240	246
L. Croton river, from Muscoot river to West Branch, west side	217	188	78	86
M. East Branch of Croton river, east side	493	723	313	455
N. East Branch of Croton river, west side	849	795	461	474
O. Middle Branch of Croton river, east side	147	157	118	109
P. Middle Branch of Croton river, west side	182	221	95	136
Q. West Branch of Croton river, east side	355	375	244	287
R. West Branch of Croton river, west side	242	282	193	222
Grand totals	5, 056	5,612	2,843	3,293

TABLE IV — Summary by Towns — (*Continued*).

	Total.		Require Special Attention.		
	Houses.	Outbuildings.	Houses.	Outbuildings.	Cemeteries.
Westchester County:					
Cortlandt	55	73	24	30	2
Yorktown	414	580	234	324	4
Newcastle	216	218	109	136	6
Bedford	785	786	381	405	11
Poundridge	73	78	41	44	3
Lewisboro	334	362	160	174	6
North Salem	397	418	227	237	3
Somers	377	402	171	209	6
Totals	2.651	2,917	1,347	1,559	41
Putnam County:					
Carmel	661	706	427	436	11
Southeast	742	701	492	490	10
Patterson	386	537	202	341	4
Kent	292	338	208	276	6
Putnam Valley	19	34	10	18	1
Philipstown	4	4	3	3	...
Total	2,104	2,320	1,342	1,564	32
Dutchess County	301	375	154	170	10
Grand total	5,056	5,612	2,843	3,293	83

Totals for Villages and Hamlets.

Westchester County — *Yorktown:*					
Huntersville	9	10	9	10	...
Crompond	38	89	19	42	1
Croton Dam	12	23	12	23	...
Kitchawan (Croton South)	11	6	11	6	1
Croton Lake	2	11	2	11	...
Yorktown Station	50	9	25	5	1
Hallock's Mills	10	15	10	15	...
Pine's Bridge	21	7	21	7	...
Newcastle:					
Mertens (Merritt's Corners)	16	10	1	......	...
Newcastle (see Mt. Kisco)	......	......	......	......	...
Bedford:					
Mt. Kisco	270	170	131	96	2
Bedford Station	54	45	18	8	1
Katonah and Whitlockville	102	88	68	59	1
Bedford	20	6	......	......	...
Poundridge:					
Boutonville	20	18	19	17	...
Lewisboro:					
Woodsbridge	3	2	3	2	...
Katonah and Whitlockville *(see Bedford)*	......	......	......	......	...
Golden's Bridge	34	25	16	14	...
Cross River	53	39	38	19	2
South Salem	35	26	9	9	2
North Salem:					
Purdys	72	31	72	31	...
Croton Falls	88	91	38	52	...
Salem Center	33	29	16	14	1
North Salem	49	36	32	29	...

TABLE IV — Totals for Villages and Hamlets — (*Continued*).

	Total.		Require Special Attention.		
	Houses.	Outbuildings.	Houses.	Outbuildings.	Cemeteries.
Somers;					
Somers	39	22	10	7	2
Somers Center	45	37	17	18	1
West Somers	29	34	6	11	...
Amawalk	14	10	8	9	...
Putnam County — *Carmel:*					
Baldwin Place	11	13	4	6	...
Mahopac Falls	32	30	14	15	2
Mahopac Mines	10	4	8	4	...
Lake Mahopac	126	65	67	36	...
Crafts	7	7	4	4	...
Carmel	122	67	83	34	3
Southeast:					
Drewville	7	15	7	15	...
Tilly Fosters	36	4	22	4	...
Dykemans	21	13	5	9	...
Brewster	273	49	59	24	2
Southeast Center (Sodom)	46	30	17	10	...
Milltown	17	21	14	15	1
Patterson:					
Haviland Hollow	10	14	10	14	...
Patterson	86	57	17	28	1
Towners	31	15	14	6	...
Kent:					
Ludingtonville	31	23	22	22	...
Farmers' Mills	34	20	24	20	...
Kent Cliffs (Boyd's Corners)	14	10	12	10	1
Dutchess County:					
Pecksville	15	14	10	9	1
Reynoldsville	12	6	7	6	...
Pawling	47	12	25	10	1
Quaker Hill	19	28	7	6	1
Totals	2,136	1,406	1,033	821	28

C. Description of Maps and Sketches.

PLATES I TO IV.

Nearly all the information in Tables III and IV is given on the accompanying maps. On Plate I a square black spot indicates a house and an x an outbuilding. The number accompanying the x is the number of outbuildings located at that point. The proximity of houses and outbuildings to streams is indicated as closely as possible on the scale to which the map is drawn. Where a barn or a privy is so close to a stream that its drainage falls or runs directly into it the fact is indicated by the letter b for barn or stable, and p for privy or water-closet. C indicates a church, G a cemetery, the number of which is eighty-three, including in the term all private or family burying-grounds, some of which contain as many bodies as the public grounds. Sh indicates a school-house, the privies of which are often set very near to water-courses. M indicates a mill. The greater number of mills are saw and grist-mills. There are a few cider-mills, woolen-mills and factories. All are included in Table IV in the column of houses deserving special mention. The letter E, with number accompanying, indicates elevation above the Croton datum. I am indebted to the chief engineer of the Aqueduct Commission for those along the Croton river; to the chief engineer of the New York Central and Hudson River railroad for those along the Harlem division, and to the chief engineer of the New York City and Northern railroad for those along that road. The elevations of the various lakes and reservoirs are from the Aqueduct Commissioners' report of 1883–7. The numbers from 1 to 832 attached to houses and villages are those of Mr. Lucas' report. The angles with letter and number indicate the position and direction in which photographs were taken, the vertex of the angle denoting the location of the camera, and the diverging lines defining the limits of the view. A detailed description of all the photographs is given in the list of photographs appended. Only the photographs whose position could

not be located on Plates II, III and IV are located on Plate I The basis of the map, Plate I, is a tracing from the map made by the engineers of the Aqueduct Commission. A reduced copy of this map, including also the entire courses of the aqueducts, was published in the Report of the Aqueduct Commission, 1883–7. A copy of that map is appended (Plate Ia, not reproduced) to show more clearly than on the crowded Plate I the location of the different reservoirs and proposed sites for reservoirs. The proposed sites, colored green on the Plate Ia, show the location, in fact, of flat, marshy or peaty tracts in most cases.

Plates II, III, IV give sketches of the principal villages and collections of houses on the water-shed. These sketches are in general taken from those given in the county atlases, all being reduced to a uniform scale, and the houses and outbuildings located from inspection. Only an approximate accuracy is therefore claimed for them, but it is sufficient for the purposes of this report. Contour lines, where given, were usually sketched on estimates made by the eye. A short line of levels was run in Mount Kisco as a basis for the estimates. The lines show fairly well the slope of the ground in the vicinity of the villages, and the direction of drainage. The symbols used on Plates II, III and IV are the same as those used on Plate I, except that stores, mills, churches, etc., are denoted by a hatched rectangle, and outbuildings by a small white square. Where they have been identified definitely, the houses described in the report of Mr. Lucas have been denoted on these plates by the initials of the owners, as given in his report under the number which is given to the village as a whole.

D. Descriptions of Villages and Hamlets.

WESTCHESTER COUNTY — TOWN OF YORKTOWN.

Huntersville is a small hamlet, having less than fifty inhabitants. It is below Croton dam, and *will be entirely submerged after the Quaker bridge dam is built.*

Crompond, on the north side of the main valley and about four

miles distant therefrom, is a small, straggling village containing about two hundred inhabitants, and extending for a mile or more in three directions along two intersecting roads. Two small streams, with several branches, drain the village, about half of which is considered to drain directly into the brooks. The open nature of the soil under this village, together with the common form of privy pit and cesspool, leads to the conclusion that, unless the houses are very much scattered, the amount of pollution poured into the soil is often greater than it can take care of, and that a progressive deterioration in the quality of water draining from it will ensue. It therefore seems expedient to include the entire village in the columns of buildings requiring special attention (in Table IV), and to extend to all of the houses any system that may be selected for disposing of the organic wastes. This conclusion will apply to all of the villages in this list. Any one of the approved methods of disposal could be applied to the village of Crompond. Probably the cheapest would be the pail system, the contents of the pails being removed to a distance of at least 200 feet from any water-course, ploughed into the soil and thoroughly mixed with it.

Croton Dam is principally below the Croton dam, and the *greater part of it would be submerged by the new reservoir.* That part above the present dam, or that part on the shore of the new reservoir, can be regulated by general rules regarding the shores of reservoirs.

Kitchawan (Croton South) is a station on the New York and Northern railroad. Like several other stations on this road, it owes its existence to the railroad, and has promise of further growth in the future. A small stream (C II and C IIa of Table IV) drains the village directly into Croton lake. Photograph Kitchawan (Plate V) shows five barns or stables on the stream C IIa, and there is another a short distance below these. (See descriptions of photographs.) At present the place

can be brought under a general regulation applying to all houses and outbuildings near streams; but if it should increase in size in the future, as seems quite likely, special provision should be made for it. The pail system in that case would probably be the most economical. (See recommendation for disposal of contents of pails and garbage depositories, p. 156.)

Croton Lake (Croton North) is at present but a station building on the New York and Northern railroad, and needs no special mention, except that it has opportunities for future growth which may be taken advantage of, as they have been in case of other stations on this road.

Yorktown Station is a village with a population of about 250. "Almost the first building erected here was the pretty little depot of the New York and Northern, only a very few years ago," so few that the village is on none of the maps, not even the map of the Aqueduct Commission. Photograph Yorktown (Plate XLV) shows the situation of the village. The plain at the foot of the hill on which most of the village is located is a drift deposit of clay, sand and gravel, in layers. A large peat bog, perhaps fifty acres, occupies a considerable portion of this plain, and most of the remainder is marshy in its character. This bog is the source of two streams, one of which (D II of Table IV) flows in a southerly direction into Croton lake, and the other (G IIId of Table IV) flows north into a branch of Muscoot river. Most of the village drains into these two brooks, a few of the houses on the northeast side of the town draining into the stream G IIIc of Table IV. The railroad-cut through the northern end of the hill on which most of the village is located indicates that the hill is largely of the drift deposit, and that the layers of gravel are very coarse and open. That part of the village at the foot of the hill would come under a general regulation concerning water-courses, but the rapid growth of the village, which has apparently but just begun, and the open character of the soil,

with the probability that impervious strata are not very far below the surface, would justify the conclusion that a system of exclusion of sewage from the soil should be applied to the whole village for its own protection, as well as for the protection of the purity of the water draining from its site. The village is well located for the economical construction of a system of sewers, if sufficient water supply can be obtained for flushing. There is plenty of ground about the town for the application of the system of sewage disposal by irrigation, or by intermittent filtration. It is probable that the latter would be more satisfactory, and it will not be difficult to select a place where the soil is of proper constitution and of sufficient extent. so that the effluent water will be thoroughly purified. The above is suggested on the theory that the village will increase rapidly and considerably in size. At the present time some system of dry removal, which need not be applied to the entire village, would be sufficient. It is an easy matter to drain the swamps by giving them deeper outlets in the direction of either stream.

Hallock's Mills is not on the railroad, is very small and has no signs of growth, so that it can be brought under the general regulations.

Pine's Bridge is upon the south bank of Croton lake, and can be regulated by rules regarding reservoirs and lakes. *A portion of the place would be submerged by the Quaker Bridge reservoir.* The place is, to some extent, a summer resort, especially for picnics or excursion parties, and has some summer residences, but is not a growing place, perhaps partly on account of the uncertainty regarding the construction of the Quaker Bridge dam. Photograph CL 3, Plate VII, shows a portion of the place.

TOWN OF NEWCASTLE.

Mertens is a station on the New York and Northern Railroad, similar in character to Kitchawan. The railroad station is on or

very near the summit, and a portion of the ground drains to the south, away from the Croton. This is not shown on the map of the Aqueduct Commission, which by some error includes about two square miles to the south of Mertens in the Croton watershed, which should properly not be included. The old map of the Aqueduct Commission of 1857–8 is correct on this point. Merritt's Corners is but a short distance from the railroad station. That portion of the village within the Croton watershed should be treated in the same manner as Kitchawan.

Newcastle is considered as a part of the village of Mount Kisco, with which it is now incorporated. Photographs N 1 to N 9 are of parts of Newcastle and Mount Kisco.

TOWN OF BEDFORD.

Mount Kisco lies partly in the town of Bedford and partly in Newcastle. It has a population at present of 1,200 to 1,500, and is a thriving village. It has quite a reputation as a summer resort. Numerous cottages and boarding houses have been erected in the village and its neighborhood within a few years, and the indications are that it will increase in the same direction in the future. The main part of the village is in the vicinity of the railroad station on the Harlem division of the N. Y. C. and H. R. R., on a level tract at the foot of Mount Kisco, which hill is just off the limits of the sketch, Plate II. Part of the village is on a little higher elevation in the vicinity of Kirby's pond and a number of new houses have been built to the west of the railroad on the slopes of the hills in that direction. Some of these are beyond the limits of the sketch given on Plate II, but are located on Plate I, the general map. The village is drained by Kisco river, which flows from Kirby's pond (Kisco lake) towards the west into Croton lake (stream C V of Table IV), and by a sluggish branch (C Ve) of this river which flows through the main part of the village and joins the Kisco river to the southwest of the village. The

contour lines on the map will show the direction of the surface drainage. Kirby's pond is a mill-pond, a large part of which is very shallow and subject to much growth of aquatic plants. Slight variations in the level of the water are sufficient to expose and again cover large portions of the bottom. The photographs N Ia, and N Ib, Plate XXII, show the appearance of the surface. The plate also shows the location of buildings on the shore of the lake. See list of descriptions of photographs for full descriptions of all the photographs. The vegetation in the pond imparts a slight tinge to the water of the river. There is a good fall to the Kisco river, as indicated by the contours, until a level plain east of the railroad is reached, just below the 290-foot contour line. From this point on for a half mile or more there is but little fall, and the fields on each side are either marshy or subject to frequent overflows. Three brooks run in from the south in this distance and one from the north. The one from the north is the one shown on the sketch of the village as running through it. This brook has but little fall throughout its course, and has so little from the 290-foot contour line down to its junction with the river, that it has almost no current. A considerable portion of the village, including all the business portion, is seen to be very nearly on the level of the brook, so that its drainage is very poor. There is a fall from the railroad station to the flood line of the Quaker Bridge dam of 83 feet, or to that of the Croton dam of 123 feet. Good drainage can be secured by taking out a dam on Kisco river, or what remains of it, at a point below the limits of the sketch, and perhaps blasting a channel for a short distance through the rock bottom of the river. The matter was under discussion by the village authorities during the summer. Here, as elsewhere, the surface soil is light and porous, and it would be taking no more than proper precautions in order to preserve the purity of the water supply, to apply whatever system of disposal of refuse may

be adopted to the whole village, including in the term all shown on the sketch, at least. A large cemetery, apparently quite new, is located at the point marked G, extending from the road to the railroad, and draining in part into each of the streams shown. It is scarcely to be doubted that this cemetery, as it becomes filled, will exercise a detrimental influence upon the water of the streams. Its site appears to be a drift deposit of sand and gravel, probably with clay or "hardpan" underlying it. Although the village is much scattered, it would not be difficult nor very expensive to put in a system of sewers. A supply of water for flushing could be obtained. If the flats are properly drained, as suggested above, it would be possible to select sites for irrigation fields or intermittent filtration beds, of sufficient extent and far enough distant from the ground water or the streams, to insure a pure effluent. A pail system, or other system of dry removal, could be easily applied, and would possibly be cheaper than a water-carriage system, owing to the scattered location of houses in some parts of the village. A system of dry removal should be thoroughly applied, and should include all garbage and household waste, especially in the lower parts of the town, but would not then touch the question of drainage from the streets, a question that is discussed on pages 153 *et seq.* The photographs, part of which are reproduced in Plates XXII to XXX, give an idea of the most evident sources of pollution and of the topography of the village.

Bedford Station, on the Harlem division, has had a slight growth within a few years, but not by any means so rapid as Mount Kisco, as its population is still less than 300. It is located principally on a side hill, whose surface drainage is down across the railroad into a branch of Beaver Dam brook (E Ib of Table IV). It is rather compactly built, and while there are but few buildings which can be said to drain directly into the brook, all have a greater or less effect upon the purity of the surface drainage and ground water. This is especially true

regarding surface drainage, as the steepness of the hill makes the carriage of material easy in times of rain. The entire village should probably be included in a system of removal of wastes, which system would doubtless be one of dry removal. See sketch, Plate II, and Mr. Lucas' report, page 20.

Katonah. The villages which are known in Mr. Lucas' report (page 19) and on the maps as Katonah and Whitlockville will here be considered together, since the one is practically a continuation of the other, as will be seen by reference to the sketch (Plate II). They both lie in the two towns of Bedford and Lewisboro. The direction of the surface drainage is clearly seen from the contour lines. The character of the shores of the mill-pond running through the village is shown in the photographs, some of which are reproduced in Plates XXXI to XXXVIII. (See list of descriptions of photographs for full explanation.) A sewer or drain, described in Mr. Lucas' report (page 19), enters the mill-pond at the bridge near the business center of the village. It formerly had several connections from houses, which are *said to be* broken now. It is an open stream for its upper course and runs under a lane and houses for the lower part of its course, as indicated by a full line and a dotted line on the sketch. The lower part of the village, below the dam, known as Whitlockville, has a small stream running through it, on which are located several privies and barns, whose drainage it receives as well as the garbage from the houses. This stream takes its rise near the graveyard (marked G on the sketch), and as the soil is here as open as elsewhere, it probably receives some pollution from that source. The graveyard also drains directly towards the river, but probably not so much as in the other direction, as rock crops out at the road. At the upper edge of the sketch, south of the river and west of the road, is a sloping piece of ground with two brooks through it, one shown, which could possibly be adapted for the purification of sewage by irrigation or filtration through land if a system of sewers were

provided. Great care would be necessary to give sufficient distance for thorough purification of the polluted liquids before ground-water or the brooks were reached. Another and possibly better place is at the extreme north of the sketch, on the other side of the Cross river. *If the Quaker Bridge dam is built, both these places will be flooded,* as the flood-line of the new reservoir will come about to the 206-foot contour line of the sketch. *In this case most of Whitlockville and some of Katonah would be flooded* and so disposed of. This would increase the necessity of taking care of the remaining portion of the village as the more thickly settled portions would be nearer the shore of the reservoir. It would then be impossible to find a place for the sewage disposal scheme above suggested without pumping. The system of dry removal discussed on page 156 would then be the most economical, I presume.

Bedford village is situated on a summit, and but a small part of it is on the Croton water-shed. The drainage of nearly all of this portion could be easily turned in the other direction, and can all be regulated by the general rules.

TOWN OF POUNDRIDGE.

Boutonville is a small village which has apparently seen its best days, and as there is no good reason for its improvement or increase, to even its former size, it may be left to the operation of general rules. There are several houses and outbuildings in the village that need attention, as their drainage now runs directly into the streams, of which there are three within the limits of the village. See Mr. Lucas' report, Nos. 36 to 39, page 19.

TOWN OF LEWISBORO.

Woodsbridge is very small, but is on a steep hillside or at its foot, and will require care in applying the general regulations, and perhaps some increase in the distances there laid down. If the Quaker Bridge dam is built *part of the houses will be*

drowned out, and the rest will be much closer to the banks, and, therefore, require more careful attention.

Katonah and *Whitlockville.* See same under TOWN OF BEDFORD.

Golden's Bridge is twenty to thirty feet above the level of the Croton river at present. Its surface drainage, and the drainage from some houses and outbuildings, runs into a small brook which flows through the center of the village. A detailed statement of the buildings draining directly into the brook is given in Mr. Lucas' report, on page 17. The sketch on Plate III will add some information. The whole village drains more or less directly into the brook, and should be included in a scheme for removal of refuse. A system of dry removal would probably be preferable. Should the Quaker Bridge dam be built, the level of the water would be raised to a height at flood stage only eleven feet below the railroad depot, and would bring the whole village, with the exception of *four or five submerged houses*, close to the shore of the lake, in which case it would be especially necessary to include every house and outbuilding in the scheme of sewage removal. In deciding upon a system, the future growth of the village should be taken into account. It is in the center of a district of summer resorts, and has as many advantages as any of the others, which have not been fully developed. Should the new dam be built, the village would have a great additional advantage in the lake, and it is quite probable that its population, especially in the summer season, would appreciably increase.

Cross River is a small village, which may, in the future, become a summer resort, for which it is fully as well fitted as others in the neighborhood. Should a railroad be put through here (laid down on maps as projected) the village would undoubtedly increase rapidly in population. Mr. Lucas' report, page 19, gives a statement of the buildings draining directly into the river and a brook which runs through the village. The sketch, Plate II, shows the position of the houses with reference to the streams. All the houses not mentioned as

draining directly into the streams are on steep slopes, which run up from the beds of the streams. I think the soil is very open and not deep, so that leachings from cesspools and privy pits find their way easily and quickly into the water-courses. The houses on the north side of the street running to the north-west drain into the small brook, and are, perhaps, at a safe distance from it, with a few exceptions near the bridge crossing the brook. The houses on the south side of the same road, and the graveyard, G, drain directly into the river, and are probably not at an entirely safe distance. All the houses on the street running south drain down the slope into the river, and require, I think, the application of a system of dry removal. The village being at some distance from the railroad, it will probably be necessary, from an economical point of view, to dispose of the refuse by ploughing it into the ground at a distance from any water-course sufficient to render the drainage from the field innocuous.

South Salem is at present small and possibly will remain so. Its topography is quite similar to that of Cross river, the distances of houses from the stream being usually somewhat greater, however. At present it could be left to the operation of general rules. Reference to the sketch on Plate III will show the buildings requiring special attention.

TOWN OF NORTH SALEM.

Purdys is quite compactly built, filling a level tract at the junction of the Titicus and Croton rivers. Surface drainage from the village runs into both rivers. The sources of most direct pollution are upon the banks of the Titicus river, as described in Mr. Lucas' report, page 17. Photographs, P 1, 2, 3, 4, Plates XXXIX to XLII show the character of part of these. Photographs CL 21 and 22, Plates XVII and XVIII, give a general view of the site of the village. The sketch on Plate III shows by contour lines the direction of flow of surface drainage.

In view of the porous nature of the soil it is evident that the continuously acting pollution by cesspools and privy-vaults should be discontinued. A system of sewerage would hardly answer, owing to the small elevation above the water in the river, unless the sewage were pumped up to some higher elevation for disposal. Sufficient water for flushing sewers could be obtained from the Titicus river, a little above the village. Under proper supervision a system of dry removal could be made to work satisfactorily. (See page 156 for proposed methods of disposal of wastes.) *Should the Quaker Bridge dam be built, the flood-line of the new reservoir would be about at the level of the railroad bridge across the Titicus river,* shown in Plate XVIII. Apparently this would place a large part of the village on the space between flow-line (200 feet elevation) and flood-line (206 feet elevation), and would require the removal of most of the village which stands upon the flat, since the ground-water would be so close to the surface at all times as to prohibit cellars, or other underground construction, and the surface would be liable to overflow. The small remnant of the village in this case could be most easily taken care of by a system of dry removal.

Croton Falls is also upon a level tract at the foot of a hill. The level is, however, at the top of a bluff, perhaps twenty feet high, so that the village is higher above the river than Purdys. A system of sewerage could be put in here if a sufficient water supply was furnished. It would be rather difficult to find a tract of land level enough for the ordinary systems of sewage disposal, without pumping. The level tract, shown in Photograph CL 25, Plate XXI, is too low for this purpose, being overflowed at times of high water in the river. This would be true, especially if the Quaker Bridge dam was built, for then this field would be, I think, in the reservoir, or in the space between the flood line and the flow line of the reservoir. The surveys under the Aqueduct Commission have not been carried to this point as yet, so that the exact line of the new reservoir at this place has not yet been

determined. It is possible that a field of the proper sort could be found in the tongue of land between the East and West Branches of the Croton river, to the northwest of the ground shown on the sketch, Plate III, for a system of disposal of the liquid sewage. Some system of sewage removal, either wet or dry, is quite necessary. Mr. Lucas' report, page 18, gives details of direct pollution. Photographs CF 1 and 2, the latter reproduced in Plate XLIII, give views of some sources of such pollution, and CF 3 (Plate XLIV) gives a general view of the village. The sketch on Plate III gives an idea of the topography. The fall in the East Branch, just above the village, gives considerable water-power for mills and factories, which is utilized to considerable extent, and will be utilized to its full extent, to judge by the building operations going on this summer. Most of the level ground adapted for building purposes is shown in the sketch, and it is probable that most of the increase in population will be upon this area. The mills, not shown on the sketch, are above the village, and should be included in any system of sewerage and disposal of waste laid out for the village.

Salem Center is strung out for some distance along a road running on the north side of Titicus river. One or two small brooks drain portions of the village, but most of it drains directly into Titicus river, toward which the ground slopes. Most of the village can be left to the operation of general rules. It may be necessary to apply some system of collecting refuse matter to that part at the extreme west of the sketch, which system would evidently be one of dry removal. It would be best to apply the system to the whole village, upon the principles indicated in preceding descriptions of villages. See sketch of village, Plate III.

North Salem is contiguous to Salem Center on the east and likewise lies along the road running on the north side of Titicus river. It will, perhaps, require more careful attention than

Salem Center, as it is not scattered quite so much, is in general nearer the river and has more small brooks running through it and discharging into the river. A system of dry removal, preferably, should be applied to the entire village. The two villages can, perhaps, be most economically treated as though they were one. Mr. Lucas' report, page 25, will give details of houses and outbuildings draining directly into the river and the brooks, and the sketches on Plate III will show the same and other points requiring attention. A sewer could be laid to take the drainage from both villages, and sufficient water to flush it could probably be obtained from the brooks or elsewhere. It will not be so easy to find a suitable place to dispose of the sewage, as the outlet would necessarily be nearly at the level of the river in order to take the drainage from the lower end of Salem Center. The villages are at some distance from railroads, so that the solid refuse would probably be disposed of close at hand, and should then be so disposed of as to thoroughly purify all drainage from it before such drainage reaches any stream. Two railroads are down on the atlases as "projected" through this valley. There is no immediate probability of substantial increase in population in either of these villages unless one or both of these roads is built, when such an increase would doubtless occur.

TOWN OF SOMERS.

Somers is at present small, and has but one small brook into which any considerable part of surface drainage runs. The village can be left to the operation of general rules with safety and economy. The brook drains two cemeteries, and it is probable that they are the source of some pollution to it. This is the only thing in the village requiring special attention. See sketch on Plate III. The village is an old one, and is the business center of the town. It is of some repute as a summer resort. It is not likely, however, to increase much in size,

unless the "projected" railroad on the maps is built, especially since the following, Somers Center and West Somers, are both railroad stations.

Somers Center is a station on the Mahopac branch of the Harlem Railroad. It owes its existence principally to this road, and is increasing slowly in population. Plum brook runs through the village, and also two small brooks, its tributaries. A few buildings drain directly into these streams. Nos. 156 to 160 of Mr. Lucas' report, page 24, are some of these. This place and the country in its vicinity are of considerable repute as summer resorts, and I think it probable that the population tributary to this station will continue to increase. This fact, and the number of streams running through the place, make it advisable to apply some system of refuse collection to the village, which system should be extended far enough in all directions to cover the probable growth of the village, so far as it may follow the course of the streams. The ground in the vicinity is quite broken, and most of the houses at any distance from the streams are well elevated above them. This is especially true of the road called Lowell street, though there are numerous springs along the street, the protection of which should be carefully looked after. What little low ground there is along Plum brook is marshy in character, and it would be difficult to find ground for the proper disposal of liquid refuse, according to any of the common systems, without elevating at least a portion of the sewage by artificial means. A system of dry removal could be arranged, owing to the steep slopes over much of the village, in such a way as to be in no way a nuisance, more easily than in any other village described. The railroad gives an opportunity to carry off the solid refuse, if the scheme suggested on page 156 should be adopted.

West Somers is a station on the New York and Northern railroad. It is very much scattered, and seems to be in the process of moving to the railroad station from an old location

near the Muscoot river on the road from the station to Somers Center. There are several scattered houses requiring special attention, some of which are given in Mr. Lucas' report, Nos. 125 to 135, page 23. It is probable that this village will increase considerably in size, if it receives proper encouragement; for this reason, as a matter of economy, some system of removal of refuse should be adopted, which can be extended as the village grows. The parts requiring special attention at present are at some distance from the station and can be corrected by an application of the general rules.

Amawalk is a station on the New York and Northern railroad. It is a very small place and is not likely to increase much in size, owing to its proximity to Yorktown and West Somers. Several buildings in the vicinity need especial attention, but they can all be taken care of by a proper application of general rules. (See Mr. Lucas' report No. 49, page 22, for description of part of them.

PUTNAM COUNTY—TOWN OF CARMEL.

Baldwin Place is a small place which has been the victim, I understand, of an attempted "boom" at the hands of the real estate agents. It does not seem to have been materially affected by the boom up to this time, but the future may have something in store. The Mahopac Mines branch of the New York and Northern railroad here leaves the main line. The place may be left to the operation of general rules. I would call special attention to the row of houses and outbuildings along Tomahawk avenue, and to the row parallel to that road, which drain more or less directly into the brook shown running parallel to the avenue from Baldwin Place, into Muscoot river. Several of these places need special and early attention.

Mahopac Falls lies in the valley of the Muscoot river just below the outlet of Lake Mahopac, and perhaps eighty to one hundred feet below the level of the lake. The Mahopac Mines branch of the New York and Northern railroad runs

through the place. The village is thoroughly well drained by the Muscoot river and one or two brooks, and probably every house is the source of more or less pollution to the streams, so that a system of refuse removal should be adopted. Should a system of dry removal be adopted this village could be combined with the village of Lake Mahopac, which it joins, and the two treated together. Should a sewerage system be adopted for Lake Mahopac, Mahopac Falls would probably be treated separately from the difficulty of finding a proper place for sewage disposal works below the level of the latter village. In Mr. Lucas' report the village is called Red Mills. See No. 144, page 23.

Mahopac Mines consists only of the mine buildings and a few scattered houses of the superintendent and of the operatives. The vein is of magnetic iron ore, with but little, if any, impurity. There is a certain amount of drainage water pumped from the mine which finds its way more or less directly into the water-courses. This drainage water should contain none but mineral impurities, which are not properly of an injurious character. A system of removing the excreta of all workmen and animals that are employed in or about the mine should be put into operation to prevent the pollution of the said drainage. This could consist in part of water-tight boxes located for the use of the miners at places convenient to them when at their work, these boxes to be removed and emptied at intervals, their location being changed from time to time as the workings extend.

Lake Mahopac village extends round three sides of Lake Mahopac and to some distance south from the lake to the station of the Mahopac branch of the Harlem railroad, and to some distance east from the lake to the station of the New York and Northern railroad. That part of the village about the latter station is below the level of the lake and drains into Broad brook and thence into the West

Branch of the Croton river. It is the principal business part of the village, and is the most thickly settled. The elevation E 639.1 on the map Plate I is that of the New York and Northern railroad station. The portion of the village about the Harlem railroad depot is also a little below the level of the lake, and drains through small brooks into Plum brook, and thence into Croton river direct. The remainder of the village consists principally of summer hotels, boarding-houses and cottages, arranged along the banks of the lake, and draining into it. An attempt has been made at an addition to this part of the village on the northeast shore of the lake, which has not yet succeeded. Some of the houses needing special attention are mentioned in Mr. Lucas' report, Nos. 145 to 147, page 23, and Nos. 557 to 562, pages 38 and 39. There are a number of others deserving special mention, especially hotels and boarding-houses, whose sewers or surface drainage run directly to the lake or to water-courses. Photographs M 1 to M 9, part of which are reproduced in Plates XLVI to XLIX, show the position of some of the prominent buildings with reference to the lake. The place was at one time very extensively patronized as a summer resort, and is still quite popular, although the number of summer visitors is not so great as in former years. It is passing through what may be called the secondary stage of a summer resort, having received a set-back some years ago from an outbreak of diseases due to bad drainage. The village is well located for the introduction of a system of sewers to drain the entire village. With the exception of the summer-resort section the village lies below the level of Lake Mahopac, so that a water supply could be drawn from it. Many of the summer hotels and cottages now draw their supply from the lake by means of pumps run by steam or by windmills, and a small expenditure would give the village a water supply of sufficient amount and head for all purposes. There are

numerous opportunities for disposing of the sewage by irrigation or intermittent filtration, as the ground slopes down from the lake in all directions but the north. A number of small, independent systems of sewers would probably answer the purpose best. Some method of disposing of the wastes now polluting the streams and the lake must be adopted, and I think that as a matter of profit it would pay to introduce a complete system of water supply and sewerage. The village could then pass to the third stage of the watering-place, and be assured of a steady popularity.

Crafts is a small station on the New York and Northern railroad. At present it can be left to the operation of general rules. It is possible that it will increase in population in the future, but the prospect of such an increase is not very bright at present. See Mr. Lucas' report, Nos. 587 to 590, page 39.

Carmel, the county seat of Putnam county, is on the New York and Northern railroad, on the shore of Lake Gleneida. A row of houses and outbuildings on the shore of the lake drains more or less directly into it. The drainage of the business portion of the village, on the west side of the main street, goes into the lake also. The ground slopes down in all directions but the south almost from the lake shore, so that the surface drainage from the remainder of the village goes in a direction away from the lake into a small stream tributary to the Middle Branch of Croton river. Lake Gleneida drains through a small creek and Horse Pound brook, into the West Branch of Croton river. Attention is called in Mr. Lucas' report, pages 40 and 41, to several houses in the village whose drainage runs directly into the lake. The sketch, Plate IV, shows the location of these houses and of others of similar character. Photographs C 1 to C 6, part of which are reproduced in Plates LXII to LXV, give general views of the village and detail views of some of the principal sources of direct pollution.

The photograph C 1, Plate LXII, in connection with the contour lines on the sketch on Plate IV, will show clearly the direction of the surface drainage in the different parts of the village. It is reported — with how much truth I am unable to say — that the water in wells near the lake shore does not come from the lake, but comes from the opposite direction. The lake itself has no inlets with a permanent flow and very little surface drainage, and is fed almost entirely by springs. Carmel could apply a scheme of water supply and sewerage such as that suggested for Lake Mahopac quite as easily and perhaps more cheaply than that village, with great benefit to itself as well as to the purity of the lake and streams. Either such a system or a system of dry removal should be applied to the whole village, as almost all drainage from buildings reaches some water-course, with more or less of its pollution still remaining.

Drewville.—This seems to be a name given to a collection of houses connected with one of the farms of the late Daniel Drew, southwest of the Middle Branch storage reservoir. While most of these houses need special attention, the general rules will be sufficient to take care of them. See Mr. Lucas' report, Nos. 432 to 439, page 35.

Tilly Fosters is a station on the New York and Northern railroad at the Tilly Foster iron mines, on a peninsula projecting into the Middle Branch reservoir. There are many mine buildings and stables, and some residences and boarding-houses on this peninsula, the surface drainage from all of which goes quite directly into the reservoir. There are two groups of miners' houses near the shores of the reservoir to the north and south of the peninsula to which the same remark is applicable in a somewhat less degree. (See Mr. Lucas' report, page 36; also Photographs TF 1 to TF 3, Plates LVIII to LX.) There must be considerable drainage pumped from the mine, which also finds its way into the reservoir. This drainage has but

little, if any, injurious mineral impurity. Some arrangement for removal of human excrement (and animal excrement so far as possible) from the mine should be instituted and carefully carried out, to prevent the pollution of the mine drainage by it. One method has been suggested for Mahopac Mines, which may also be applied here. A system of removal (preferably dry) of organic refuse from the mine buildings, houses and stables should be carefully carried out. The proximity of Brewster makes the disposal of this refuse easy, if the plan suggested on page 156 is followed. Otherwise there are fields well up on the hills away from the reservoir, into which it can be ploughed, with the assurance that the drainage from the fields will be purified before it reaches the water-courses.

Dykemans is a small station on the Harlem railroad and the New York and New England railroad, which seems to have no special reason for further growth. At present a strict enforcement of general rules would be sufficient to preserve the purity of the small brook into which the village drains. Special mention is made of some houses in the village in Mr. Lucas' report, Nos. 279–282, page 30, which list should be somewhat increased in number.

Brewster is the largest village on the watershed. While but little larger than what has been included in Mount Kisco in Table IV, it is more compactly built, and is more of a manufacturing and business place, so that it is a much greater source of pollution to the Croton water than any other village. Mr. Lucas' report, pages 27 and 28, gives details of many of the sources of direct pollution. The sketch on Plate IV shows these, and others, and also shows by the contour lines the general course of the surface drainage. Photograph B 1, Plate LXI, shows the drainage of a slaughter-house near Tonetta brook, above Brewster, beyond the limits of the sketch. B 2 to B 4, Plates L to LII, together give a view of the village and a

prolongation of it to the southwest down the river. B 5 to B 10 part of which are reproduced in Plates LIII to LVII, give details of special sources of pollution. The surface drainage from the principal part of the village runs almost directly into Tonetta brook, and is a source of much pollution to that brook. The sewers which enter the brook under the main street are an additional source of concentrated pollution, since the supply of water to the sewers is quite small. The soil seems to quite as open here as elsewhere, so that the drainage from it is daily increasing in richness. I think it probable that as good a plan as any for treating this village is to supply it with a complete system of sewers, for which its topography well adapts it. As indicated above, there has been something done in this line already. There are two or three places where the liquid sewage can be disposed of on the land as suggested on page 155, and will be efficiently purified before entering the water-courses, all below the level of the village, so that the sewage need not be pumped. These are all near the river, so that very great care should be taken in maintaining the disposal works. It may be deemed advisable to divide the sewer system into two or three parts, and run part of it on each of two or three plots of ground. The proposition discussed on page 156 would locate a garbage and refuse destructor near the intersections of the three railroads, at the northern end of the village, to which all refuse from the villages on those railroads would be carried. If such a destructor is erected it may be found to be more economical to use some method of dry removal in this village, the refuse being carried directly to the destructor. The village of Southeast Center is but a short distance to the east of Brewster, and it will be worth while to discuss the two villages together in determining upon a sewerage system. One advantage of a water-carriage system in these villages, as in the cases of Carmel and Lake Mahopac, will be that by a

proper arrangement it may be possible to run a portion of the earlier street drainage, in case of a rainstorm or of the melting of snow in the spring, into the sewers, and thus obtain a purification of this water, which is certainly in a high degree polluted with animal matter.

Southeast Center, or *Sodom*, as it is called on the map issued by the Aqueduct Commissioners, is a village along both sides of a road running northeast and southwest, crossing East Branch of Croton river, with a few houses along a road running on the northeast bank of the river from the above-mentioned crossing. It is just below the site of the new East Branch storage reservoir, and its surface drainage is directly into the river. It is included in the description of Brewster in Mr. Lucas' report, page 28. If this village were to be treated alone, some system of dry removal would probably be the best, but it should receive consideration in its relation to Brewster, as it is probable that the two could be economically treated as one.

Milltown is a very small village, a large proportion of whose houses require special attention. A number of houses in its immediate vicinity also require special attention. Mr. Lucas' report, Nos. 237 to 247, page 29, will give most of these. Probably the place can be safely left to the operation of general rules, but these should be strictly carried out.

TOWN OF PATTERSON.

Haviland Hollow has a number of houses along the north side of the road running along Quaker Brook, most of which require special attention, as shown in Mr. Lucas' report, Nos. 317 to 334, page 31. They are situated on the side of a hill of rather steep slope on which the solid rock outcrops in numerous places. The soil is probably quite thin and, while the Hollow may be properly taken care of under general rules, it may be necessary in some cases to increase distances as

given in those rules, in order to bring these places to the same degree of safety as those places at which the drainage into water-courses is less direct and quick.

Patterson is on the wide valley of the upper part of the East Branch of Croton river, and is in general quite flat. It is just above the large peat swamp mentioned on page 6, and the eastern part of the village is almost down to its level. The portion west of the Harlem railroad is a little higher and could easily be sewered, if thought best. The village is in a very pleasant situation, with the exception of that portion which is so near the level of the surface waters, but it does not seem to possess the spirit of growth and may remain at its present size for some years. The great swamp, which extends in both directions from the town along the river, is a great source of vegetable pollution to the Croton water. It would be possible, at the expense of blasting and dredging out an outlet and a channel, to drain this swamp, as there is plenty of fall before the village of Southeast Center is reached, but the construction of East Branch storage reservoir will raise the water level at that point to such a height that but little fall will be left for such a purpose, so that it can be accomplished but partially, if at all. The ground water must be quite close to the surface in all but the highest part of the village, so that, while there are but few houses whose surface drainage reaches the water-courses directly, it is probable that the leachings from cess-pools and vaults reach the ground water very quickly. The purity of the water in the wells of the village, as well as, and even more than the purity of the Croton water supply, requires the introduction of a system of disposal of wastes which shall render them, or the drainage from them, innocuous before entrance into water-courses. Probably a system of dry removal would be most satisfactory. Photograph, Patterson (not reproduced), was an attempt to show the situation of the village. Mr. Lucas' report, page 32,

gives one or two houses requiring special attention. The sketch of Patterson, on Plate IV, will show others and the general course of the drainage on the surface. The small stream east of the railroad, which turns at right angles, is a ditch, intended to drain a large flat series of fields, which is not a very great success, owing to the little fall. The East Branch has almost no current at this point, and runs in several channels at the point where the road crosses it. But one of the channels is shown on the sketch.

Towners, a station on the Harlem railroad and on the New York and New England railroad, is small, but is quite thoroughly drained by several small brooks, and has several houses which require special attention, as may be seen from the map, Plate I, or from Mr. Lucas' report, Nos. 387 to 410, pages 33 and 34, including the neighborhood tributary to the station. It is possible that the careful application of general rules will be sufficient in this case, as the houses are scattered over so large a space, but it may be found necessary to apply a system of dry removal to some of the more thickly settled portions near or on the banks of brooks.

TOWN OF KENT.

Ludingtonville is quite small and can be left to the operation of general rules. There are several houses requiring special attention, part of which are mentioned in Mr. Lucas' report, Nos. 512 to 516, page 37.

Farmers' Mills is similar to Ludingtonville, but a little more closely built. It can, however, be treated in the same way. Most of the houses requiring special attention are described in Mr. Lucas' report, Nos. 694 to 709, pages 43 and 44.

Boyd's Corners (Kent Cliffs Postoffice) is on the shore of the West Branch reservoir, and therefore deserves especial attention. Numbers 682 to 690, page 43, and 720 to 725, page 44, of Mr. Lucas' report are houses on or very near the shores of the

reservoir. Photographs BCR 1, 2 and 3, two of which are reproduced in Plates LXVIII and LXIX, show the character of the banks and the direction of drainage. A general rule applicable to reservoirs and their surroundings should be sufficient to regulate the place.

Cole's Mills has several buildings requiring special attention, but a careful application of general rules should be sufficient to regulate them. See Plates LXVI and LXVII for views of some of them.

DUTCHESS COUNTY.

Pecksville can probably be left to the action of a general rule. It may be necessary to use a method of dry removal for some of the buildings, owing to the width of lots not being sufficient to cover a reasonable distance within which no cesspool or privy should be allowed. There are several houses needing special attention, none of which are mentioned in Mr. Lucas' report.

Reynoldsville is a station on the New York and New England railroad which contains some houses requiring special attention. Numbers 354 to 359, page 32, of Mr. Lucas' report are some of these. Their regulation can be left to a careful application of general rules.

Pawling is a large village on the Harlem railroad. A part only of the village drains south into the Croton, as the summit between the Croton water-shed and the Housatonic runs through the village. That portion of the village draining south is deserving of special attention, and will require some system of removal of refuse. To the south, the valley of the tributary of the Croton is flat and wet, with but little fall. It might be possible to put in a system of sewerage for the whole town, to run towards the north, but such a system would hardly be economical for this southern portion of the village. It is probable that a system of dry removal would prove most economical and generally satisfactory. Photograph, Pawling,

(not reproduced) shows the situation of the village. In Mr. Lucas' report, Pawling is No. 426, pages 34 and 35. There are some houses requiring special attention which he has not mentioned. Those mentioned as draining into brooks running north are outside the Croton water-shed and their surface drainage does not reach it.

Quaker Hill is a small settlement on the top of a hill at the head-waters of the East Branch of Croton river. It can be left to the operation of general rules. There are a few buildings requiring special attention.

E.—General Sources of Pollution.

1. The principal product of the farms near the railroads is milk, and the greater portion of each farm is pasture. This is true to a great extent over the whole water-shed. It is probable that but little fertilizer is used upon the cultivated fields beyond the product of the cow-stables, so that the pollution of the water from this source is in general small. There may be found near reservoirs, present or prospective, special cases which deserve attention.

2. A very fertile source of pollution is the drainage from roads and streets into the water-courses in times of rain. The character of this pollution must be particularly obnoxious in spring or late winter rains, after the accumulation of the droppings upon the roads during the whole winter. I noticed this especially in Katonah and Brewster during rain storms, and in Mt. Kisco just after one. In all these cases the drainage from the streets ran directly into water-courses, and presented, during the earlier part of the storm, an extremely filthy appearance. There are many places to which this observation would apply. The main roads are usually in the valleys, along or near the banks of streams, and are graded to discharge their drainage into these streams. It will be possible in many cases to so retard and spread out the water running along the road ditches, by turning it upon land, as

to cause a precipitation, straining, and partial filtration, and thus purify the water in great part. This should be done to quite an extent. It is quite necessary that some such plan should be pursued with the roads running along the banks of reservoirs. A very fair result could be obtained by grading such roads so that the surface drainage from the road alone should all run towards the lake, by giving the road a transverse slope in that direction. Concentration of water into channels can be prevented by giving as little longitudinal slope as possible to the road, and by frequent stoppages of flow along the road, by obstructions placed on the lower side. Great care should be taken to carry all drainage from ground above the road directly across under it. If the road is a sufficient distance from the edge of the water in the lake, say 100 feet, the actual drainage therefrom will be fairly purified before reaching the lake.

The treatment of streets in villages is discussed in Division IV of this report.

3. Another probable source of pollution, as well as of discomfort and possible disease to the people of the neighborhood, will be the alternate growth and decay of plants in those portions of the reservoir subject to fluctuations of level in the water. At present the Croton lake is kept at very nearly the same level at all times, so that there is no appreciable trouble in that reservoir from this cause. The secondary reservoirs have banks of such slope and nature that, when water is drawn to supply the Croton lake, a comparatively small proportion of bottom is uncovered, which is of such a character that but little vegetation grows upon it, and hence no serious difficulty from this cause need be anticipated.

When the Quaker Bridge dam is built, the flow line of the dam will be about thirty-four feet above the present level, and the flood line forty feet above it. This will extend the lake from its present upper extremity a little below Muscoot hill and the mouth of

Muscoot river, to a point nearly up to Croton Falls and the junction of the East and West Branches of Croton river, a distance of about eight miles, with arms each about a mile in length extending up Muscoot river, Cross river, Plum brook and a brook on the east between Katonah and Golden's Bridge. The Cross river arm will have two branches, each about one mile in length additional. The greatest depth of water in this new portion of the Croton lake will be but thirty-four feet, at flow line. Some of this depth is quickly lost in ascending the stream, as is shown in the profile of the Quaker Bridge reservoir, given on the map published in the Aqueduct Commissioners' Report, 1883–87 (Plate IA of this report, not reproduced.) It is even more quickly lost in ascending the arms, as will be indicated by the fact that there are dams near the present mouth of the Muscoot and of the Cross river. These facts show that there will be a large amount of shallow water in the upper portions of the new reservoir. There will be some shallow water on the sides of the lower portion of the new reservoir also. Photographs CL 1 to 25, part of which are reproduced in Plates V to XXI, are intended to show the character of the slopes and of the surface of the ground in the bed of the new portion of the reservoir. They show that slight fluctuations of level will expose large amounts of the bottom to view, and that the ground surface is very suitable for the growth of vegetation. The growth of vegetation would probably increase in time from the deposit of flood materials brought down by the streams. These deposits would encourage such growth by decreasing the depth of the water, and by furnishing a supply of nutriment, especially so far as the deposit may consist of organic matter. They would be made at the points where the velocity of currents is checked on entering the reservoir, which are also the points of least depth. As the drainage from about eighty-five per cent of the water-shed would enter the new reservoir above the Muscoot hill, it is evident that the amount and character

of such deposits are worthy of serious attention. Should no subsidiary dam be built, the entire reservoir would be subject to variations of level, giving rise most probably to much malarial illness in the vicinity, and deteriorating the condition of the water. A slight idea of the character of such vegetation and of the effect of drawing off the water may perhaps be gathered from an inspection of photographs N 1a and N 1d, Plates XXII and XXIII, for a description of which see List of Descriptions of Photographs. It is proposed to build a subsidiary dam to preserve the level of the water in the upper portion of the lake. Two sites have been suggested for such a dam, which is generally known as the Muscoot dam, as one site is near Muscoot hill. The upper site is near Woodsbridge, above the mouth of Muscoot river. About seventy-five per cent of the entire drainage area is above this site, the Muscoot river being the only large stream entering the new portion of the reservoir below the Muscoot dam and above the present Croton dam. It is about ten and one-half miles from Quaker Bridge dam and seven miles from the upper end of the new reservoir. A rough estimate gives about seventy-two per cent of the area of the reservoir below this site. Under the same conditions of water consumption, the fluctuations of water level below the Muscoot dam would therefore be about forty per cent greater in amount than if the Muscoot dam were omitted; that is to say, a depth of ten feet over the reservoir as a whole, would give a volume of water equivalent to a depth of fourteen feet over that portion below the upper site of the Muscoot dam. An estimate made by the eye indicated that a reduction of level of ten feet below the flow line or sixteen feet below flood line would uncover only about one-third more ground above the site of the Muscoot dam than a reduction of fourteen feet below flow line, or twenty feet below flood line, would uncover in the space between the two proposed sites for the dam. This would indicate that the lower site would answer the purpose for which the dam is to be erected

much more nearly than the upper site. An examination of photographs, CL 11 to 16, reproduced in Plates XII to XVI and fully described in the List of Descriptions of Photographs, will show the extent and character of ground lying between the two sites. About eight per cent of the area of the whole reservoir, roughly estimated, is between the two sites, so that the fluctuations of level in the lower part of the reservoir would be somewhat increased, under the same conditions of management, say to an amount fifty-five per cent greater than were the reservoir to act as a whole.

Should the subsidiary dam be built, its effect would be to reduce the number of times that it would be necessary to lower the level of the upper portion of the reservoir, but the growth of vegetation in the shallow parts of the reservoir would continue. There are quite extended tracts in the neighborhood of Purdys, between Purdys and Croton Falls, and in the arms of the reservoir up the brook near Golden's Bridge, Plum brook, Muscoot river and Cross river, which would be sufficiently shallow to permit such growth. The extent of such shallows would be increased by the sedimentation of the influents. The character and amount of vegetation would be affected by the nature of this sediment, which, coming mainly in times of flood, contains generally a large amount of organic impurity, the result of the thorough washing of many streets, roads, yard areas, barn-yards, and so forth, whose drainage does not reach the streams except in times of copious rainfall. This vegetation can be killed by drawing down the level of the water. It can then be raked out of reach of the water and disposed of in some manner to prevent its return. It may also be raked out of the water without drawing down the level; or the bed of the reservoir in the shallow places can be denuded of its soil, and sufficient depth given to the water to prevent the growth of vegetation. A natural rock bottom can be easily obtained in many places. The material thus excavated can be used to fill along the shores and raise their level above

the flood level of the reservoir, thus restricting the flow of water to the reservoir proper. This would seem to be advisable in several places, particularly in the Cross river arm and in the neighborhood of Purdys, where there is a considerable amount of ground between flow line and flood line of the reservoir, including a large part of the village. Photographs CL 21 to 25, Plates XVII to XXI, show this territory. When the topographical surveys of the reservoir, now in progress under the Aqueduct Commission, are finished, the subject should receive careful attention with the accurate data, then obtainable, to give definiteness to the problem. The character of sedimentary deposits can be determined by an examination of the bottom of the upper end of the present Croton lake. A casual examination last summer indicated that it was rather bad, and was the source of some pollution to the water, both in itself and in the vegetation which it assisted to sustain. Photographs CL 1, 2, 3, 5, Plates VI and VII, give some idea of the state of the case. It is probable that it will be necessary to arrange for a removal of this deposit at intervals, if considerable depth is not given to the upper reservoir and its arms, by the excavating process suggested. The present Croton lake is beginning to show the necessity of removal of its deposits, and it would seem to be even more necessary in the case of the new reservoir, as much less of the flood water (containing a much larger absolute quantity of impurity, as indicated above,) will be allowed to flow over the the dam and thus out of the reach of the water supply.

F. Descriptions of Photographs.

The following descriptions of photographs are arranged in geographical order, beginning at the lower end of Croton lake: First is given a series of photographs of Croton lake from Croton dam to Croton Falls; then photographs of localities to the south and east of Croton river; on Muscoot river and its tributaries; on East Branch of Croton river; on Middle Branch of Croton river;

on West Branch of Croton river. The first series of twenty-five, marked CL, 1 to 25, Plates VI to XXI, were intended to show the character of the present Croton lake and of the bed and banks of the proposed new reservoir; the remainder show the character of the sources of organic pollution, and are fairly representative of the inspections made by Mr. Lucas, and of the cases set down in Table IV as deserving special mention. The attempt was made to secure photographs of the worst cases, but in some instances this was impracticable. Plates V to LXIX are reproductions of those photographs which were best adapted therefor, and accompany this report. The others in the list are on file in the office of the State Board of Health. The location and scope of each photograph is indicated on the maps, Plates I to IV, by an angle, the vertex at the position of the camera, and the sides defining approximately the limits of the view. Each is numbered to correspond with the number in this list.

Plate V.—*Kitchawan.*—Near the railroad station Kitchawan on the New York City and Northern railroad, on the road to Croton dam, on a small stream running into Croton lake, and about half a mile from it. The stream is C II in Table IV. The four nearer stables in the view are used, I think, for the teams hauling brick from the yard near Kitchawan to the new aqueduct, and have not been long in use. The manure piles are run out to the brooks and drain directly into them; every rise of the water must carry more or less of the matter away. The stable in the back-ground is close to one of the branches of the brook and drains directly into it. Another stable is located on the bank of the brook lower down towards Kitchawan. Located on Plate I.

Plate VI.—*Croton Lake,* 1.—This is the first of a series of views, Croton Lake 1 to 25, designed to show the present condition of Croton lake and the character of the ground to be covered by the proposed new reservoir. It is a view up an arm of the reservoir, looking west. The outlet of the brook C II mentioned above is at the farther end. There are several houses and barns, and a

blacksmith shop there, as indicated on the map. One or two of them show dimly through the trees on the left. A house and barn are seen at the right of the center on a steep bank just above the lake, which will be close to the edge of the new reservoir and will require attention. The gentle slope of the shore in the fore-ground and the growth in the shallow water along the shore should be noticed in connection with the descriptions of the other photographs of Croton lake, as an indication of the probable state of affairs at numerous places along the shores of the new reservoir; and especially in connection with the photographs of Croton lake up to 16, as some idea can be thus obtained of the character of the ground and vegetation to be exposed by fluctuations in the water level of the new reservoir, below the Muscoot dam. Located on Plate I.

Croton Lake, 2.—A cove of the arm of Croton lake described above, connected with the lake by a culvert under the road. The small stream, C III of Table IV, flows into it. There is very little circulation of the water to and from this cove, and we found at one visit a scum composed of some of the offensive algæ upon a portion of its surface, which had disappeared at a second visit, when the photograph was taken. Not reproduced. Located on Plate I.

Plate VII.—*Croton Lake*, 3.—A view of a portion of Pine's Bridge, taken from the bridge over the lake. Especial attention is called to the houses with cupolas, which are hotels, and to the barn, privy and pile of garbage and manure to be seen near the right of the picture in the rear of one of the hotels. The outlet to a brook (C IV of Table IV), which drains ten other houses and two barns, back from the lake, as well as the outbuildings mentioned, is seen near the right edge of the picture as a stream running out of a culvert under the road. The houses visible will be submerged by the new reservoir. The character of the growth in shallow parts of the reservoir is indicated in the foreground. Located on Plate I.

Croton Lake, 4.—A view on the north shore of the lake, above Pine's Bridge, looking east. Muscoot hill shows in the center, far in the background. The level of the new reservoir when full, forty feet above the lake seen at the right, will be near the top of the house on the left. Some idea of the amount of ground subject to alternations of wet and dry by fluctuations in the water level can be thus obtained. The photograph was taken from a point near the edge of the new reservoir, but perhaps a little above its level. Not reproduced. Located on Plate I.

Croton Lake, 5.—A view of a passage between an island and the north shore of the lake, looking west, taken to show the effect of banks of little slope, and without stony beach. Much of the vegetation here shown was on the point of decay when the photograph was taken, and the appearance of the water was rather unpleasant. This series of photographs shows several places of greater area which may be in similar condition to the one shown. While this sort of pollution may not be dangerous to health, it is unpleasant to sight and taste when in sufficient quantity. The water is put through no filtering process to remove it. The island and the shallow channel prevent much circulation, and so the full effect is shown. Not reproduced. Located on Plate I.

Croton Lake, 6.—A view looking south up Kisco river (C V of Table IV), showing what will be an arm of the new reservoir. The house on the right will be close to its edge; the one in the center will be submerged by it. The slopes of the banks and bottom are here of better character. Not reproduced. Located on Plate I.

Plate VIII.—*Croton Lake*, 7.—The views Croton lake, 7, 8 and 9, together form a panorama and show an arm of the new reservoir, (7); the north shore looking up the lake, (8); and a view diagonally across and up the lake, (9); as seen from the top of a low hill which will project into the new lake. The pictures match quite closely in

the order named and show clearly the character of slopes and bottom. The flood line of the new reservoir will be forty feet above the present lake, glimpses of which are caught in the center of No. 9. This height will bring the new shore line about to the road at the house in the center of No. 8. The camera was set only slightly above the new level of the water. It will thus be seen that almost the entire fore-ground in each picture, back to the foot of the hills, will be submerged, and some estimate can be made of the amount of ground subject to fluctuations of level of less than forty feet. The hill near the right of No. 8 in the back-ground is Muscoot hill. Located on Plate I.

Plate IX.—*Croton Lake*, 8.—See Plate VIII, Croton Lake, 7. Located on Plate I.

Plate X.—*Croton Lake*, 9.—See Plate VIII, Croton Lake, 7. Located on Plate I.

Plate XI.—*Croton Lake*, 10.—A view up an arm of the new reservoir at the first brook below Muscoot hill on the north side of the lake. Apparently this arm extends to the foot of the hill behind the house to the left of the center, with two small branches, one to the right and the other to the left. If so, most of the ground shown at the foot of the hills will be covered with but a shallow depth of water, decreasing slowly towards the head of the arm, so that a number of acres (perhaps one hundred) will be subject to variations of the shore line over them, with changes in the level of the water. It is likely that the water over a large part of this area would be for appreciable lengths of time shallow enough to allow the growth of aquatic vegetation such as shown in Photographs Croton Lake, 1, 2, 3, 5 and N 1a to N 1d, Plates VI, VII, XXII, XXIII, and in larger quantity. The area could be treated as suggested for the upper portions of the reservoir, page 90. Located on Plate I.

Plate XII.—*Croton Lake*, 11.—Photographs, Croton Lake 11 to 16, were taken from points on the northerly slopes of Muscoot

hill, with the purpose of showing the character of the banks and bottom of the arm of the new reservoir at the mouth of the Muscoot river, which is below the upper site of the proposed Muscoot dam at Woodsbridge, and above the proposed site at the Muscoot hill. The first four (11 to 14) were taken at one point and together form a panorama including the greater part of the area. The other two (15 and 16) were taken from a point two or three hundred feet east of the first, and form together a panorama of the remainder. 11 and 12 match very closely. An inspection of buildings and horizon lines will show the connections of the others. Fifteen includes a part of 13 and of 14. Sixteen includes the remainder of 14 and some additional. All but 14 are reproduced in Plates XII to XVI, which thus give a view of the entire area. This area has been estimated at about eight per cent of the total area of the reservoir. As the elevation of flood line in the new reservoir will be but forty feet above the present lake, and less than that amount above the water in the river, where it shows among the trees a little to the left of the center of 15, Plate XV, it is evident that much of the area will be but slightly covered, and that the whole will be subject to great changes of shore line by comparatively slight changes in level. As the intensity of the changes below the Muscoot dam will be increased by its insertion to preserve the level of the upper portion of the lake, and as this arm is one of the greatest in extent of the shallow parts of the upper portion of the reservoir, it would seem to be advisable to locate the Muscoot dam at the lower site, and thus relieve this large area from liability to large fluctuations in level. This subject, as well as the subject of the treatment of shallows, is discussed on pages 89 to 91. Eleven looks up the valley of Muscoot river, and is a continuation of 12 to the left. Located on plate I.

Plate XIII.—*Croton Lake*, 12.—Is a continuation of 11 to the right. Muscoot river runs at the foot of the hill in the middle ground, behind the hill with the white house, having come down

through the depression showing back of the house. It runs to the right to the building on the extreme right. The water in the new reservoir will be on three sides of the hill with the white house, and will extend up the river, according to the map, for half a mile or more beyond it. Located on Plate I.

Plate XIV.—*Croton Lake*, 13.—Is a continuation of 12 to the right. The building on the extreme left is the same as the one on the extreme right of 12. Muscoot river runs from this building along the line of trees in the middle ground to join the Croton river just to the right of the picture. Nelson's race-track is on the right. The new reservoir will submerge this track and the water level will be near but below the houses showing beyond the barn near and on the level of the track. Located on Plate I.

Croton Lake, 14.—Is a continuation of 13 to the right. Woodsbridge, Whitlockville and Katonah lie in the hollow in the center and behind the hill to the right. The upper site for the Muscoot dam is near the houses showing in the hollow. Croton river comes down through this hollow, flows to the left along the line of trees to the left of the center, receives Muscoot river at the extreme left, turns more than a right angle and flows to the right across the picture beyond the slope in the fore-ground. Nelson's race-track is in the low ground beyond the nearer trees on the left. It will be submerged by the new reservoir. Fifteen and sixteen were taken from the top of the of the slope in the fore-ground of this picture. Not reproduced. Located on Plate I.

Plate XV.—*Croton Lake*, 15.—Taken with 16 at the point located in the description of 14, shows on the left the barn and buildings and Nelson's race-track the same as at the right of 13. Woodsbridge is in the extreme right back-ground. Croton river flows as in 14 from this point to the left, receiving Muscoot river at the extreme left, turning and flowing to the right at the foot

of the slope in the fore-ground. According to the map the shore line in the new reservoir will be between the barn on the left and the houses showing beyond it, the race-track and the fields on the other side of the river (in the center) being submerged. The new level will be less than forty feet above the river showing in the trees to the left of the center. Located on Plate I.

Plate XVI.—*Croton Lake*, 16.— Continuation of 15 to the right. The tree in the foreground at the right of 15 and the left of 16, will show (on the photographs but not on the Plates) the amount of lap of the two pictures, which is but slight. Woodsbridge, the upper site of Muscoot dam, is in the background at the extreme left, near the houses showing faintly. Croton river, after flowing from this place back and forth, as shown in 15, Plate XV, flows towards the right across 16 among the trees in the middle of the picture. The lower site of Muscoot dam is near the right of the picture. Located on Plate I.

Croton Lake, 17.— Shows an arm of the new reservoir on the branch of Plum brook which enters Croton river from the north in the bend below Golden's Bridge. Croton river is reached through the gap in the center of the middle ground. The map indicates that the arm will extend up into the low place at the left of the picture, and that it will cover the flat in the middle ground to the right of the center. A branch of this arm extends up Plum brook for some distance but with steeper slopes to the banks. As the increase in elevation of the water level at flood line above the present level in the river will be only about thirty-five feet, and the ground shown is a half mile from the river, with some fall, it is evident that the depth of water in the arm will be small, and that there will be plenty of shallows to allow of the growth of vegetation, even if the Muscoot dam is built to prevent fluctuations of water level and the consequent periodic

uncovering of the greater part or all of the bottom of the arm. Not reproduced. Located on Plate I.

Croton Lake, 18.— A flat plain on the west bank of Croton river, opposite Golden's Bridge. The view is taken looking up the river. The level of the plain is from five to perhaps fifteen feet above the water in the river. The water level at flow line in the new reservoir will be about twenty or twenty-five feet above the present water level. Should the Muscoot dam not be built a large part of this tract would be subject to uncovering by fluctuations of level. Not reproduced. Located on Plate I.

Croton Lake, 19.— Nineteen and 20 were taken from a hill projecting out into the Croton valley on the west side of the river, between Golden's Bridge and Purdys. Nineteen looks south towards Golden's Bridge, and 20 looks northeast towards Purdys. The water level will be near twenty or twenty-five feet above the river showing in 19, and somewhat less than that in 20. The railroad in 20 is perhaps ten feet above the new level of the water. Not reproduced. Located on Plate I.

Croton Lake, 20.— See Croton Lake 19. Not reproduced. Located on Plate I.

Plate XVII.—*Croton Lake*, 21.— Twenty-one to 24 were taken from the side of a hill near (but above) the level of the water in the new reservoir, north of Purdys. Twenty-one and 22 were taken from the same point, and may be put together as one picture. Twenty-three and 24 were taken from slightly different points, but can be connected, as the bridge over the Croton river shows near the right of 22 and near the left of 23. The buildings at the extreme right of 23 are the same as those at the extreme left of 24. Titicus river runs from left to right through 21, 22 and 23, falling over the saw-mill dam near the left of 21, whose elevation above Croton datum is 212 feet, flowing thence to the right over the dam of the condensed milk factory, showing near the

right of 21, thence across 22 under the railroad bridge in the center of that picture, and part way across 23, where it shows itself at the left of the center of the picture. It enters Croton river at the right of the center of 23. Croton river flows from right to left from the right of 24, across 24 and 23, in which latter it receives Titicus river, thence under the wagon bridge showing in 23 and 22, and on south through the hollow near the center of 22. The village of Purdys shows in 21 and 22 on the farther side of Titicus river. Some of the buildings in 21 and 22 are shown more in detail in photographs P 1 to P 4, Plates XXXIX to XLII.

These views are intended to indicate the probable condition of affairs in the neighborhood when the Quaker Bridge dam is built. The buildings on the right of 21 are those of a condensed milk factory on the bank of Titicus river. The elevation of the top of the dam showing in front of the building is 201.3 feet. The center of the wagon bridge over Croton river in 22 and 23 is also 201.3 feet, one foot above flow line (200 feet elevation), or five feet below flood line (206 feet elevation) of the reservoir. The elevation of the center of the railroad bridge over Titicus river (in the center of 22) is 206.5, or five-tenths of a foot above flood line. The center of the track opposite the station in the village of Purdys, at the point where smoke is seen rising in 22, has an elevation of 205.2, or eight-tenths of a foot below flood line. Much of the village is slightly below this elevation. It will be seen from these figures, and from a consideration of the photographs (reproduced in Plates XVII to XX) that at flow line there will be a large amount of the bottom land shown in 23 and 24, and some shown in 22, which will be barely awash; and that at flood line there will be a large amount more, shown in all four pictures, in the same condition, including most of the village of Purdys, the extent of which can not be seen from the photographs, but can be determined from the contour

sketch, Plate III. The entire bottom land and the village would thus be subject to fluctuations of level between these two elevations. The soil seems to be quite fertile, being now subject to occasional overflows, and would seem to be an excellent medium for the propagation of such vegetation as grows in shallow waters. The organic portions of the sediment brought down the Titicus river would tend to increase the fertility of the soil (as is seen in the case of Kirby's pond, Plates XXII and XXIII), a large portion of which, as well as most of the inorganic sediment, would be deposited on these shallows, where the current of the stream is checked by entering the lake. If left without attention, we have the probability before us of the tract becoming a marsh. The village would be within the line of danger from floods, and if not removed would require very strict regulations regarding drainage and disposal of organic wastes to prevent pollution of the water. This would seem to be a proper place to apply the remedy suggested on page 90, or its equivalent. Located on Plate I.

Plate XVIII. — *Croton Lake*, 22. — A continuation of 21 to the right. See Plate XVII, Croton Lake, 21. Located on Plate I.

Plate XIX.—*Croton Lake*, 23.— A continuation of 22 to the right from a slightly different point of view. See Plate XVII, Croton Lake, 21. Located on Plate I.

Plate XX.—*Croton Lake*, 24.— A continuation of 23 to the right from a slightly different point of view. See Plate XVII, Croton Lake, 21. Located on Plate I.

Plate XXI.—*Croton Lake*, 25.—The field in the fore-ground is on the bank of Croton river, which flows in the line of low bushes just back of the center. The upper end of the new reservoir extends nearly or quite up to this field. The view is taken looking south, down the river. I believe the exact upper end of the reservoir has not yet been determined. The railroad on

the left of the picture is about forty feet above the level of the water in the new reservoir. The longitudinal slope of the valley is quite gentle, and there will be a length of shallow water from Purdys to this upper end. The field shown is at present subject to floods, and will be more so with the new reservoir, even if the shore line of the reservoir does not reach it. Located on Plate I and also on Plate III in the village of Croton Falls.

N 1a.—N 1a and N 1b show the condition of Kirby's pond (Kisco lake), near the village of Mt. Kisco, during the summer. The pond is evidently very shallow and has a large growth of aquatic vegetation which affects the taste and color of the water. This may be taken as a fair sample of the probable condition of affairs in shallow portions of reservoirs where there is little or no current except as produced by winds. It is similar to a number of mill ponds on the water-shed in appearance and in effect upon the water. Some of these ponds were more nearly stagnant and in filthier condition than Kirby's pond when visited; but the condition of this pond is said to have been better than usual this year. The pond is produced by a mill dam, and it is now in process of draining, the mill-power having been given up. N 1c and N 1d are two photographs showing the character of the bottom and the mat of dead vegetation on the bottom, and giving some idea of the method of drainage proposed. The surface is covered on most of the area with a layer of aquatic grass and weeds. The soil, of varying thickness, is a black, rich loam, overlying, where the ditches are excavated, a layer of sand and gravel under which is found in some places a layer of "hard pan." It would be conducive to the purity of the water from the whole water-shed to drain many of the small and shallow mill ponds on the small streams. Numerous swamps and bogs could also be drained as easily as this pond, to the benefit of the water. N 1a is not reproduced. It is located on Plate II, sketch of Mt. Kisco.

Plate XXII.—*N 1b.*—See N 1a. A part of the village of Mt. Kisco is shown on the shore of the lake. When the drainage of the lake is finished, these buildings will be further from the water in most cases. A few springs and little runs are close to houses, however, and will carry their drainage then, as now, to the larger water-courses, unless close attention is paid to them. Located on Plate II, sketch of Mt. Kisco.

N 1c.—See N 1a. The principal features of this photograph are shown with a little less detail in N 1d also, and N 1c is therefore not reproduced. Located on Plate II, sketch of Mt. Kisco.

Plate XXIII.—*N 1d.*—See N 1a. Intended to show character of pond bottom and plan of drainage, which is in process of construction. Located on Plate II, sketch of Mt. Kisco.

Plate XXIV.—*N 2.*—Shows a row of outbuildings of different sorts, easily recognizable, at the rear end of a row of lots along a street in the village of Mt. Kisco. The stream running in the walled channel is Kisco river, the outlet of Kirby's pond, shown in N 1a to N 1d, and the portion shown is but a short distance below this pond. The character of pollution to the water supply and the necessity of reducing its amount and directness of access to the water, are evident. It may be added that there is a pig-pen and a garbage-heap back of the building overhanging the stream. The fence of the pig-pen shows slightly. Located on Plate II, sketch of Mt. Kisco.

Plate XXV.—*N 3.*—N 3 and N 4 are two views of the tail-race and mill buildings, including a refuse-dump, on a small pond a short distance down Kisco river from Kirby's pond. The buildings have been used as a lens factory, I think, but all machinery was being cleaned out of them at the time of our visit and they are now vacant. There was a large amount of refuse of different sorts all about the premises, and especially at the points where photographs were taken. In N 4 the boy is standing on a large pile of refuse of all kinds. A small stream of very dirty drainage

was running from the frame building shown in the same picture. N 3 is taken looking towards the right from the bridge shown in N 4. The pond furnishing water to the mill was in bad condition, being partly filled up with a mass of decaying vegetation and covered with an unpleasant green scum. It is possible that the buildings will be used again for manufacturing or other purposes, and they should in that case receive careful attention. The mill pond is quite as well worthy of drainage for purposes of health and purity of water as Kirby's pond. The mill is in or quite near the village of Mt. Kisco. Located on Plate II, sketch of Mt. Kisco.

Plate XXVI.—*N* 4.—See N 3. Located on Plate II, sketch of Mt. Kisco.

Plate XXVII.—*N* 8.—This picture is slightly displaced from its proper order to bring two half-page reproductions together. It is a view of a hotel and outbuildings near and over a ditch, and draining directly into it. N 5 to N 8 are all taken from points quite near together in the flat portion of the village of Mt. Kisco, as will be seen by reference to the sketch of Mt. Kisco on Plate II. The buildings in the fore-ground of 8 will be recognized as those at the right of 6. The building with flag-staff and cupola at the left of 5 is the school-house, seen also in 7 just to the right of the center. The portion of Mt. Kisco shown in these photographs is seen to be very flat. Its drainage is very poor and much of the ground is marshy at all times. The outlet for its drainage is through a branch of Kisco river, as explained in the description of the village of Mt. Kisco, page 64. The ditch seen in 8 runs along the railroad for some little distance gathering water from both sides of the road, from the main street near the depot, and from mills, stores and houses, and then flows across 6 and 7 to meet the branch of Kisco river, as indicated in the sketch of the village. As its fall is so little and the sources of its water are so unclean, it is in quite a polluted condition before it reaches the portion of it course shown in 8.

Shortly after reaching the branch of Kisco river, the two combined receive the drainage of the buildings shown in 5. The branch, before it receives the ditch, receives pollution from the buildings shown in N 9, and from blacksmith shops, houses and outbuildings. The photograph 8 was taken with the camera set on the railroad track. Located on Plate II, sketch of Mt. Kisco.

Plate XXVIII.—*N* 5.—Shows direct drainage of house, shop, pig-pen, garbage dump and so forth, into branch of Kisco river in the village of Mt. Kisco. The stream is very sluggish, with almost no current and the effect of the reception of so much filth from these buildings and those mentioned in the description of Plate XXVII is to encourage the growth of very offensive plants as well as to thoroughly fill the water with putrefying matter in various stages of decomposition. See also the Descriptions of N 6 to N 8 and of the village. Located on Plate II, sketch of Mt. Kisco.

Plate XXIX.—*N* 6.—N 6 and N 7 were taken at the same point and together show most of the low swampy portion of the village of Mt. Kisco. The photograph N 8 was taken from the railroad on the left of N 6. The business portion of the village lies along a street running at right angles to the street shown in N 7, and is in the back-ground of the picture. It is nearly or quite as low as the portions more clearly seen, and is therefore hidden by the houses in front of it. See descriptions of N 5 to N 8 and description of village for further particulars. Located on Plate II, sketch of Mount Kisco.

Plate XXX.—*N* 7.—Continuation of N 6 to right. See descriptions of N 5 to N 8 and of village of Mount Kisco. Located on Plate II, sketch of Mount Kisco.

N 8.—See Plate XXVII. Out of its proper place to allow two half-page reproductions of photographs to come on one page.

N 9.—Shows house, privy and barn on or near the bank of the branch of Kisco river running through the village of Mount Kisco, near the upper end of the village. The stream runs across the middle ground from right to left along the

row of stones on the nearer side of the buildings. Not reproduced. Located on Plate II, sketch of Mount Kisco.

Katonah, 1*a.*— A view of the same barley pit shown in 1b, which see. Not reproduced. Located on Plate II, sketch of Katonah.

Plate XXXI.—*Katonah,* 1*b.*—A view of a barley pit which will be quite near the shore line of the Cross river arm of the new reservoir. This is one of the worst examples of a kind of structure that is common at railroad stations and in or near private barns of farmers in all parts of the water-shed reached by rail from New York. It is a place for storage of the refuse from breweries, commonly called "barleys," which is fed in large quantities to cattle on many of the dairy farms of the country. The barley is stored in pits when delivered, and is kept until winter, to be fed when green feed is lacking. The odor from the pits is strong and offensive, due to the putrefaction of the outer layers, and of the portion scattered on the ground in handling. When the pits, unloading or storage places are near water-courses, as in this case, the offensive matter is a source of pollution to the water, as well as to the atmosphere, and requires attention. Located on Plate II, sketch of Katonah.

Plate XXXII.—*Katonah,* 2.—Shows a slaughter-house, pens and barn on the west bank of Cross river, in the village of Katonah, No. 25 of Table III. The drainage of the buildings is directly into the river, and apparently the liquids from the slaughter-house, which is the nearest building to the bank, run through the small door in front almost directly into the water. The whole premises are a source of considerable pollution, especially in times of rain, and some of the matter is evidently more than usually obnoxious. The photograph tells its own story as well as it can be told. Located on Plate II, sketch of Katonah.

Plate XXXIII.—*Katonah,* 3.—Shows a carriage, wagon and blacksmith-shop and a barn on the east bank of Cross river, in the village of Katonah. A manure pile is evidently a common occupant

of a space next the barn, and drainage from this pile, as well as from both buildings, is directly into the river. Evidently the barn-yard, into which cattle are allowed to go, is open to the river. The water level of the new reservoir will be from fifteen to twenty feet above the water shown. Located on Plate II, sketch of Katonah.

Plate XXXIV.—*Katonah*, 4.—As will be seen from the sketch of Katonah on Plate II, photographs 3 to 9 are of almost consecutive ground, and show almost the entire east bank of Cross river in the more thickly settled portion of the village. The water showing in all from 2 to 11 is of a mill pond in Cross river, along the lower side of the village. The elevation of the water in this mill pond is about 186 feet above Croton datum, if my information is correct, and the level of water at flood line in the new reservoir will be about twenty feet above the present level, or fourteen feet at flow line. The road is eight or ten feet above the present water level, with slight differences each way from this height. The height of the new water level can thus be easily estimated in the photographs. The buildings shown are all on the farther side of a road, which runs parallel to the river, at the top of the wall of stones seen in some of the pictures. The drainage of these houses is towards the river. Privies and barns are set immediately on the road and drain quite directly across the road into the river. The privy on the top of the wall in 4 has stained the wall with its drainage. It is but little more conspicuous than several others which show more or less clearly in the photographs. Located on Plate II, sketch of Katonah.

Katonah, 5.—Taken a little farther north along Cross river from 4, shows other houses and barns in similar condition to those shown in 4. Not reproduced. Located on Plate II, sketch of Katonah.

Plate XXXV.—*Katonah*, 6.—A house and barn are here shown, whose drainage crosses the road and enters the river with the road

drainage. At the extreme right is seen the outlet of a sewer or drain which comes from the northern end of the village, as described in the description of the village. This is No. 25 of Mr. Lucas' report, Table III. The indications at the mouth of the drain are that considerable filth of some sort is discharged at times. None was observed at the times of our visits. Six to 9 are consecutive views so far as the water's edge is concerned. The same houses appear in the back-grounds of consecutive pictures, in different positions, owing to the overlapping of back-grounds in the pictures. All show the drainage of the street directly into the river. A lane runs down the hill to the river on the right of the house, and brings the drainage from the back yards and outbuildings of stores and houses down to the river quite readily, owing to its slope. Located on Plate II, sketch of Katonah.

Katonah, 7.—Shows additional houses and outbuildings, and additional evidence of street drainage into the river. Not reproduced. Located on Plate II, sketch of Katonah.

Katonah, 8.—Shows additional houses and outbuildings, and additional evidence of street drainage into the river. Not reproduced. Located on Plate II, sketch of Katonah.

Plate XXXVI.—*Katonah*, 9.—Shows a house draining across the road into the stream and a portion of the main street of the village, whose drainage comes down beside and under the board walk shown as coming from the back-ground, and runs into the river at the place where some planks have been laid across to keep the bank from washing in. The amount of street drainage getting into the stream as shown in these pictures is large, and I can testify from personal observation that it has a very nasty appearance, being filled with the washings from the road, including the droppings of animals and a large amount of miscellaneous refuse thrown into the streets by the inhabitants. The amount of such drainage when spring opens must be great, and its character must be even worse than that observed, from

the accumulation and the failure to dry up and blow away. It should be mentioned that the river is a convenient garbage dump for the residents along the street on its bank, as could be seen by the condition of its banks, and as was evidenced by actual observation. Located on Plate II, sketch of Katonah.

Plate XXXVII.—*Katonah*, 10.—Shows a church and cemetery which will be quite close to the shore line of the new reservoir, whose level will be fifteen or twenty feet above the water shown. The description of the village of Katonah will give an idea of the direction of the drainage from the cemetery. At the right of the picture is a large residence on the summit of a steep slope. Near the house are barns and outbuildings also on the edge of the steep slope, the drainage from which has thus direct access to the water of the stream. The necessity for attention to the manner of draining these buildings will be increased by the increased elevation of the water in the new reservoir. Located on Plate II, sketch of Katonah.

Plate XXXVIII.—*Katonah*, 11.—The shore line of the new reservoir being fifteen or twenty feet above the water level shown, will be close to or will partially submerge the buildings shown. The removal of organic wastes from these buildings will therefore require specially strict regulations. The new shore line throughout the village will be very close to the houses. The condition of affairs here, and the probability that much surface drainage will enter the water of the reservoir under any system of rules, are very strong arguments in favor of a proposition to remove all buildings of any sort, and all roads and streets to a considerable distance from the shore line. It is believed that protection from organic pollution by surface drainage directly into the reservoir along its shores cannot be guaranteed if any building or road is nearer to the flood line than, say, one hundred feet. But with such a strip of unoccupied ground around the reservoir and a proper direction given to the flow of surface water, the amount of pollution from such sources would be

reduced to a minimum. Located on Plate II, sketch of Katonah.

Plate XXXIX.—*Purdys*, 1.—The four views of Purdys give details of buildings shown in the general view included in Croton Lake 21 and 22, Plates XVII and XVIII. They are all photographs of buildings on the banks of Titicus river, and draining directly into that stream. The water level at flood line of the new reservoir will be about five feet above the water level shown in 1, 2 and 3, and nine feet or more above the level shown in 4 which is taken below the dam of the condensed milk factory. No special description of 1 and 2 is necessary. The buildings in 1 are on the south bank of the river. Located on Plate III, sketch of Purdys.

Plate XL.—*Purdys*, 2.—Buildings on north side of Titicus river just below saw-mill dam and road. See Purdys, 1. Located on Plate III, sketch of Purdys.

Plate XLI.—*Purdys*, 3.—A view of the condensed milk factory at Purdys, with a privy and ice-house and barn, all on the south bank of Titicus river and draining directly into it. The character of the drainage from the factory is described in Table III, item No. 79. The privy of the establishment is located upon the bank of the river to the right of the factory, and does not show in this view. The place evidently needs attention at the present time and will need it still more when the new reservoir is filled, if the increase in height of water level does not require the removal of the factory entirely. Located on Plate III, sketch of Purdys.

Plate XLII.—*Purdys*, 4.—Shows more buildings whose drainage is into the Titicus river. These buildings are on the south side of the river just east of the railroad in the village. Their character speaks for itself. The new reservoir, raising the water level at flood line nine feet or more above the level shown, will probably require their removal. Located on Plate III, sketch of Purdys.

Croton Falls, 1.—This picture and the following, show outbuildings and barns in Croton Falls on the edge of the steep east bank of Croton river. See Croton Falls, 2. One is not reproduced. Located on Plate III, sketch of Croton Falls.

PLATE XLIII.—*Croton Falls*, 2.—One and 2 show outbuildings, barns and privies, which drain directly down the steep east bank into Croton river. The condition of the bank indicates that it is the village garbage dump also. The slope is such that heavy storms wash everything into the water below. A portion of the surface drainage from the streets reaches the river through a gully to the left of the buildings shown, and another portion at the point where photograph, Croton Lake, 25, Plate XXI, was taken, which see. Photographs were not secured of other buildings which drain directly into the river, as indicated in the description of the village, and on the sketch, Plate III. Located on Plate III, sketch of Croton Falls.

PLATE XLIV.—*Croton Falls*, 3.—A general view of the village of Croton Falls. Croton river flows among the trees at the bottom of a steep slope just behind the buildings showing in the center. The last two photographs described were taken from the farther side of the river and show the rear ends of the lots and the buildings thereon, of which we see in this picture the fronts. The photograph, Croton Lake, 25, Plate XXI, was taken from a point beside the barn whose ridge shows at the left edge of the picture. As stated in the last description, the drainage from the streets of the village runs off the bank at that point and at a point hidden by trees just to the right of the houses at the right of the center. There are small bits of the village extending along the nearer side of the railroad in each direction from the tract shown in the picture, and a portion of the village is along the river down behind the church on the right. There is some level ground in that vicinity which might be suitable for sewage disposal works, except that it is on the opposite side

of the river from the greater part of the village. Located on Plate I, and also on Plate III, sketch of Croton Falls.

Plate XLV.—*Yorktown.*—This is a view of Yorktown railroad station on the New York and Northern railroad. It was taken to indicate the size of the village, which has grown up in a very few years, and to show a portion of the swamp which lies on two sides of it. The swamp lies both to the left and to the right of the picture. That portion stretching off to the left beyond the limits of the view is in part a peat bog and has streams draining from it in two directions, one north into a branch of the Muscoot river, and one south into Croton lake. The latter is the one which runs from left to right through the middle ground of the picture and receives a large part of the drainage of the village. There is a breadth of swamp on each side of the stream in the flat along the railroad. This runs for over a mile down the brook at intervals. There is plenty of fall between the sections of swamp and below them all, and it should be an easy matter to drain them all, including the peat bog. The tract suggested in the description of the village for sewage disposal works is on the other side of the hill on which the village stands. A tract on this side might be utilized if the swamps were drained. Located on Plate I on the road a half-mile or so southwest of the station.

Mahopac, 1.—The series of views of Lake Mahopac was taken to show the location of buildings upon the shore, but it was impossible to get views from points close enough to the shore to make the details plain, except in one or two cases. One to 5 are taken from various points along the east side of the peninsula on the south shore of the lake. One and 2 were taken from the extreme end and can be matched together as one. In 1 we are looking north, and the drainage from that direction is seen to be towards the lake from the hills. At the last hill towards the right, at the house with a cupola, the drainage begins to be away from the lake, with the exception of a strip along the lake

shore. Three or four houses and some boat-houses are seen on the shore. Not reproduced. Located on Plate I.

Mahopac, 2.—A continuation of 1 to the right. More houses, including hotels and picnic grounds are shown. Just beyond the church with the low cupola, at the right of the center, the ground slopes away from the lake quite rapidly. The business portion of the village is in this direction on that slope. Not reproduced. Located on Plate I.

Mahopac, 3.—A continuation of 2 to the right from a slightly different point of view. Additional buildings and picnic grounds on the lake shore are seen. The slope from the lake is as in 3. Not reproduced. Located on Plate I.

Plate XLVI.—*Mahopac*, 4.—A continuation of 3 to the right from a slightly different point of view. A hotel and picnic grounds are dimly seen in the trees on the left. A store is directly on the bank on the left of the center and a boat-house on the right. Part of the buildings of the Thompson House are seen on the right. A sewer from the main hotel building apparently empties into the lake in front of the hotel. It may be simply the overflow of a cesspool, but gave evidence of recent discharge at the time of our visit. Just back of the hotel the ground slopes down into a hollow in front of the hill in the background. Located on Plate I.

Plate XLVII.—*Mahopac*, 5.—Continuation of 4 to the right. All of the Thompson House buildings are seen in this view, with the exception of part of the bar-room on the edge of the water at the extreme left. The remainder of that building is seen on the right of 4. These buildings are in order, the bar-room and a lodging place over it, a wash-house, a bathing machine, a small outbuilding, barns, and a small building used as a coop for fowls and as a place for killing and cleaning fowls and fish. All these buildings are directly at the water's edge, or within a few feet of it, with drainage directly into the lake. The statement of the uses of the buildings is indication of the character of the refuse

which runs and is thrown into the water. The hotel proper is the large building whose roof shows above the trees. Here the slope from the lake only begins at the top of the hill in the background. Located on Plate I.

Mahopac, 6.—Shows a house and barns on the west side of the peninsula on the south shore of the lake whose drainage enters the water more or less directly. Not reproduced. Located on Plate I.

Plate XLVIII.—*Mahopac*, 7.—Was intended to show the buildings on a small island just off the south shore of the lake, west of the peninsula, and connected with the shore by a causeway and bridge. One building shows plainly. There are three cottages in the trees at the right of the building which shows. All are quite close to the water and have some drainage into it. These are the buildings mentioned in item 146 of Table III, I think. Located on Plate I.

Plate XLIX.—*Mahopac*, 8.—On the south shore of the lake near the west end. This view and 9 were taken from the larger island near the south shore, called Grand Island on some maps. Three or four houses are seen at varying distances from the lake. Others are concealed by the foliage. None of these are in bad condition as to their drainage into the water, but probably most of them need some attention. Located on Plate I.

Mahopac, 9.—A continuation of 8 to the right. Three or four summer cottages are seen near the lake. These are new and others are building in the vicinity, indications of an increase of interest in the place as a summer resort. The manner of drainage of these buildings and of those that may be erected in the future should be carefully attended to. The Dean House is at the extreme right. Most of its buildings drain in the other direction, I think, as the ground slopes down from the lake, beginning at the main buildings of the hotel. One or two cottages, wash-house, etc., are on the lake shore and drain into it. The outlet to the lake is a short distance to the right of the hotel. Not reproduced. Located on Plate I.

Brewster, 1.—See Plate LXI. The reproduction is placed a little out of the regular order to put two half-page plates together. Located on Plate I.

Plate L.—*Brewster*, 2.—Two, 3 and 4 are taken from a point just without the limits of the sketch of the village given on Plate IV, and show the village and a continuation of it along the East Branch of Croton river, down stream. The river runs from right to left across the three pictures, which fit very closely together and may be joined in one. It is at the foot of the slope in the fore-ground, on the nearer side of the main part of the village, which is seen in 4, and on the farther side of and close to the houses shown in 3, and the nearer houses shown in 2. The Harlem railroad runs along the side of the hill, its line showing most plainly in 3. One of the places suggested in the description of the village for sewage disposal works is at the left of 4 and the right of 3. Another is to the right of the village in 4, concealed by the foliage. Tonetta brook runs down the hill through the village, at the left of the buildings on the extreme left of 4 which stand upon its banks, and flows down across the middle ground of the picture, entering the river at a point in the center of the picture, concealed by foliage. The drainage of the entire village is either directly into the river or into Tonetta brook. The extension of the village shown in 3 and 2 is particularly close to the river and drains directly into it. A rear view of the buildings in 3 is given in 5. This extension is not given in the sketch of the village on Plate IV, and these four photographs are therefore located on Plate I.

Plate LI.—*Brewster*, 3.—See 2. Located on Plate I.

Plate LII.—*Brewster*, 4.—See 2. Located on Plate I.

Plate LIII.—*Brewster*, 5.—A view of the rear of the buildings shown in 3. The East Branch runs, as shown, from left to right, under the foot-bridge seen in the center. This shows the proximity of the houses, barns, privies and so-forth, to the river. The field in the fore-ground with the barn at the left

is subject to overflow by floods. There seem to have been no precautions taken to prevent organic wastes from reaching the river, and in some cases there is even a utilization of the stream for carrying off such wastes. Two, 3 and 4 were taken from a point about half-way up the slope on the extreme right of this picture. Located on Plate I.

Brewster, 6.— Shows a garbage dump on the bank of Tonetta brook. This appears to be the general dump of the village, and is a mass of all sorts of organic and inorganic wastes. The street drainage runs down through it in times of rain, and whatever is soluble or can be washed out is carried directly into the brook, whose water is seen on the left. The picture gives a very fair idea of the character of the heap, though it does not show all, owing to the bushes and to the limitation in size of the plate. Not reproduced. Located on Plate IV, sketch of Brewster.

PLATE LIV.—*Brewster*, 7.—Is a view taken in the culvert which conveys Tonetta brook under the main street of the village. The culvert turns quite an angle and the view is taken looking up stream from a point just within its lower end. In the large black hole at the left of the center are the outlets of two sewers which seem to come from the directions of the two branches of the main street, the one coming from the east, and the other from the north. At the top of the right wall of the culvert, at the right of the center, is seen a small pipe, egg-shaped in cross section, which is the outlet to a third sewer. A little to the right of this is seen a slimy deposit upon the wall, which indicates the outlet of a drain from water-closets in the bank building which stands just above, in the middle of the space formed by the street intersections, as shown in the sketch of the village, Plate IV. The last two mentioned are in active use, as was demonstrated to us while taking the photograph. The first two are those described by Mr. Lucas in his report, item

215 of Table III. All are sources of organic pollution, in the form principally of human excrement, and their discharge into the stream should be strictly prohibited. Located on Plate IV, sketch of Brewster.

Plate LV.—*Brewster*, 8.—This view was taken to give a sample of the manner in which a large part of the surface drainage of the village reaches the streams. In this case we have the rear of a row of buildings on the main street, just east of the culvert shown in 7. Tonetta brook runs from left to right in the fore-ground. The side of a mill standing over the brook shows on the right. The character of the back buildings speaks for itself, and the ease with which the surface drainage reaches the stream is readily seen. This drainage includes the wash from barns, barn-yards and back yards, into which much refuse is thrown, and the overflow and seepage from the privy pits. The buildings have stores upon the first floor, with tenements above. The first building on the left is a bottling establishment, which discharges its liquid refuse directly into the stream, and whose pile of solid refuse is seen against the rear wall of the building on the bank of the stream, ready to be washed into it by the rains, or thrown into it to be carried off in times of flood. Beside this building on the left are the ruins of the foundation of an old mill, which stood over the stream. Its reconstruction is possible, and should it happen, an additional source of pollution would arise. Above the culvert shown in 7 are the depot buildings of the Harlem railroad, which stand over the stream. Much of the surface drainage from the main street enters the stream at the old mill foundation and at the depot. Of the character of this drainage I can speak from actual observation during a storm. Certainly a very large amount of organic matter was washed from the street, including the droppings of animals, large in quantity from the street being a standing place for many teams, and all sorts of refuse thrown into the street

from stores and houses. Located on Plate IV, sketch of Brewster.

Plate LVI.—*Brewster*, 9.—Nine and 10 give views of a condensed milk factory and its auxiliary buildings, located at the eastern end of the village. The views were taken from the bridge of the New York and New England railroad over the East Branch of Croton river. Nine shows the rear of the factory buildings on the river and a residence or office building in front of them. A number of pipes are seen projecting from the building over the water. These are drainage pipes, discharging liquids ranging in purity from exhaust steam to the refuse from the condensers, and from washing of cans. The effect of the latter fluids upon the water can be seen for a considerable distance below the factory in the appearance of the water in the pools of the river, which is unmistakably polluted by milk, and by the peculiarities of the vegetation, due to the excess of animal matter in the water. Located on Plate IV, sketch of Brewster.

Plate LVII.—*Brewster*, 10.—Ten is taken from a different point on the same bridge from which 9 was taken. It shows a number of buildings auxiliary to the condensed milk factory. The long shed on the river bank at the right is the same one shown in 9 at the left. At the left of this shed, between it and the small dwelling adjacent, is the outlet of a ditch which can be seen to come in a straight line from the buildings back from the river, and to receive drainage from barns and houses, which thus enters the river directly. Located on Plate IV, sketch of Brewster.

East Branch Reservoir, 1.—One and 2 are views of the bed of the new reservoir at Southeast Center or Sodom, now constructing. One is taken from a point on the west side of the main reservoir a little above the stone dam, but little above the level of water in the reservoir, looking up the Covill's brook arm. The hill in the center will be an island in the new reservoir. Men can be seen at work clearing trees from the lower slope of this hill. East Branch of Croton river flows at the foot of the slope

having come round the hill at the right, and flowing thence towards the left. Not reproduced. Located on Plate I.

East Branch Reservoir, 2.—A view of the bed of the Bog brook or Mud pond portion of the reservoir, taken from a point on the east side and looking north. A glimpse of Mud pond is caught among the trees on the left. The view is taken on a steep slope from a point slightly, if any, above the new level of the water. Both views show good side slopes to the banks of the reservoir. One indicates a rather flat longitudinal slope up the arm from Covill's brook, and views of the upper end of the arm up East Branch would show still flatter longitudinal slopes, though the side slopes are in most places all that could be asked for. The reservoir is lined in with parallel blue lines on Plate I. Not reproduced. Located on Plate I.

Patterson, 1 *and* 2.—Are two attempts from two different points at views of the situation of the village of Patterson. In each the village is in the center of the picture on a flat plain extending across the view. At the right in each is a hill rising in the midst of the plain, surrounded by a marsh and peat bog which covers most of the plain to the right of and in front of the village. Not reproduced. One (the second) position of the camera is located on Plate I, nearly two miles south of the village.

Pawling.—Is an attempt to show the position of the village of Pawling. It is in the center of the picture on a slight hight of land in the bottom of the large valley, diagonally across which the picture is taken, and is nearly three miles from the point of view. The picture is taken looking a little west of north, while the great valley runs a little east of north. From Pawling the surface drainage is in both directions along this valley, north into a branch of the Housatonic and south into the East Branch of Croton river. Not reproduced. Located on Plate I, nearly three miles a little east of south from the village.

Plate LVIII.—*Tilly Foster*, 1.—One and 2 give views of the buildings and houses of the Tilly Foster Iron Mines, 1 from the east and 2 from the north. The mine buildings, with some houses and stables are on a peninsula on the east shore of Middle Branch reservoir; there are two clusters of miners' houses as shown on Plate I. In 1 are seen some of the mine buildings, a brick residence or office building and one or two houses and stables on the top of the piles of rock which have been taken from the mine and dumped on almost every available foot of the peninsula. At the foot of this pile on the shore of the reservoir, in the center of the view is a large stable whose drainage is directly into the reservoir. There is a house at the right of the stable, just hidden behind the slope of the hill in the fore-ground. At the extreme right is seen one of the southern cluster of houses. Located on Plate I. (The location indicated on the map is one-half mile due north of the place at which the photograph was taken.)

Plate LIX.—*Tilly Foster*, 2.—Shows nearly all the mine buildings and one or two boarding-houses on the peninsula. On the shore at the right of the center is a pump-house. One of the main mine buildings is the large one at the left with smoke-stack. Just at the right of this building, in the back-ground, show three of the southern cluster of miners' dwellings, apparent only as white spots. At the extreme left shows one of the northern cluster of miners' buildings, which extend thence to the left. All the buildings shown except the southern cluster of miners' dwellings and one or two on the summit of the hill, drain towards the foreground into the reservoir either near the pump-house, or at the left opposite the house on the extreme left. The mine drainage and that from the mine buildings runs in the latter course and receives an addition of organic pollution from the refuse of some of the lower houses shown. The drainage of almost the entire place requires some attention. Located on Plate I.

Plate LX.—*Tilly Foster*, 3.—Shows a barn on the west bank of Middle Branch reservoir, opposite Tilly Foster. The level of the

reservoir when full reaches nearly to the stone wall in front of the barn. This view was taken to give a sample of the method of drainage of many barns on the water-shed into water courses. It is a little more conspicuous than many, being close by a well-traveled road, and close to an artificial reservoir, but otherwise than that is no worse than many others in the list in Table IV. Located on Plate I.

Plate LXI.—*Brewster*, 1.—This is a picture of a slaughter-house which drains into the low, wet place in the fore-ground and thence into Tonetta brook. It is almost as near to Tilly Foster as to Brewster, being about 3,000 feet along the Harlem railroad, north from the crossing of the railroads at Brewster, and is classed with Brewster as it drains into Tonetta brook. It is a source of obnoxious animal pollution, and adds its portion towards the pollution of Tonetta brook, which becomes considerable before the brook enters East Branch, as may be seen by examining Brewster, 6, 7 and 8, and reading their descriptions. Located on Plate I.

Plate LXII.—*Carmel*, 1.—A general view of the village. The main street of the village runs parallel to the lake shore, with a row of houses on each side of it for most of its length. With a few exceptions the houses on the side towards the lake drain into the lake, and those on the other side drain from the lake into a brook in the hollow at the right side of the view. The nearer church steeple is that of the Presbyterian church. The view is taken from the top of Drew Female Seminary, the large building with cupola showing on the right of 2, and in 5 on the top of the hill in the background. The building near the right side is on the fair-ground. The general view shows quite clearly the feasibility of a sewerage system with outlet or outlets on the slope towards the right from the lake, where there is plenty of opportunity for sewage disposal works, at or above the level of the fair-ground. The outlet of Lake Gleneida is on the opposite side of the lake, at a point near the extreme left edge of the view.

It drains into the West Branch of Croton river. The brook on the right runs into Middle Branch. Located on Plate IV, sketch of Carmel.

Plate LXIII.—*Carmel*, 2.—Shows most of the buildings on the east shore of Lake Gleneida, more especially those not shown in 1 and 5. The Presbyterian church steeple shows near the center and Drew Seminary at the right. The first large building from the right is a so-called "milk factory," from which there is a large amount of drainage quite obnoxious in character, in the way of washings from cans and churns and the general waste of the operations carried on. The next is a tenement-house on the shore directly. Near this building, a little back, is the depot of the New York and Northern railroad. Then follow a number of buildings, houses, stores, shops, school-house and privies, barns, and so-forth, set either directly on the bank or within a few feet of it, whose drainage is quite directly into the lake. To the right of the portion shown in the view are a number of small houses on the bank of the lake, with pig-pens, privies and chicken-houses also on the banks. Though small, they are sufficiently numerous and concentrated in quality to deserve close attention. The picture was taken from the rear of one of these. Located on Plate IV, sketch of Carmel.

Carmel, 3.—Three and 4 together give a full view of Lake Gleneida. They are taken from the same spot, and together form a complete view of the lake and of almost all of the village. They give other views of the same buildings shown in the other pictures, with but few minor additions, and are on smaller scale, owing to the distance of the point of view, and are therefore not reproduced. The point of view is not within the limits of the sketch of the village on Plate IV, and they are therefore located on Plate I.

Carmel, 4.—See 3. Not reproduced. Located on Plate I.

Plate LXIV.—*Carmel*, 5.—The buildings on the east shore not shown on 2 or 6 are here shown. Those shown on 2 appear, but on smaller scale, owing to their distance from the point of view, which was a little dock at the rear of the residence of N. P. Barnes. Only the back buildings of the lots show. The houses are generally near the street and back a short distance from the lake shore, as indicated on the sketch, Plate IV. Drew Seminary shows on top of the hill in the back-ground. A little to the right of it and on or near the lake shore, are the "milk factory," railroad depot, and so-forth. Located on Plate IV, sketch of Carmel.

Plate LXV.—*Carmel*, 6.—Taken from the same place as 5, and looking in the opposite direction, this view shows the buildings about the northeast corner of Lake Gleneida. The first building on the right is a barn and chicken-house, the next a landing dock for row-boats at the hotel, the next the hotel livery stable, the drainage from which enters the lake directly, as well as the surface drainage from the hotel yard and the seepage from its privy vaults. Beyond are sheds and shops and a residence on the lake shore, and two or three residences on the opposite side of the road from the lake. Considerable road drainage enters the lake from this road where it runs along the lake shore. Located on Plate IV, sketch of Carmel.

Plate LXVI.—*Cole's Mills*, 1.—This view, taken looking up stream from a bridge over West Branch of Croton river, at Cole's Mills, needs no explanation. It is the worst case of several here and further up the stream and up a small branch which comes down from the left a short distance behind the houses shown. Located on Plate I.

Plate LXVII.—*Cole's Mills*, 2.—This view, taken from the same place, looking down stream, needs no further explanation than the statement that the house to which the barns shown belong is just to the right of the picture, and less than one hundred feet horizontally from low-water mark. Located on Plate I.

Plate LXVIII.—*Boyd's Corners,* 1.—Shows buildings at Kent Cliffs Postoffice, on the shore of the West Branch, or Boyd's Corners reservoir. The buildings shown are a store and postoffice, a church and sheds. Just off the left edge is a house on the opposite side of the road from the water. The water was drawn down somewhat at the time this picture was taken. Its highest level seems to be at the line between bare ground and vegetation, shown quite clearly in the photograph, and almost as clearly in the reproduction. Located on Plate I.

Plate LXIX.—*Boyd's Corners,* 2.—Shows, with 1, almost all the buildings near the West Branch reservoir. None of them appear to need very much attention. The one appearing to need most is near the right hand edge of the picture, and is shown in 3. Located on Plate I.

Boyd's Corners, 3.—This house has a privy set on the bank just above a small run, an inlet to the reservoir, into which it drains. This building is at the extreme right of the picture among the trees, and could easily be moved to a place at a sufficient distance from the water-course. A second house, a little nearer the water than the one in the center of the picture, shows in part at the left. Both are on the opposite side of the road from the reservoir. Not reproduced. Located on Plate I.

III.—CHEMICAL ANALYSES OF CROTON WATER.

The following from Professor Elwyn Waller, Ph. D., of Columbia College, New York city, will show what are the numbers and what the characters of analyses that have been made of the Croton water since it was first determined upon as a source of supply for the city. Many of the results have been published in the reports of the City Health Department, and elsewhere, but there are many analyses given in Table V which have not been published in any form before. Plate LXX, accompanying, gives a graphical representation of the variation in amount of

the various impurities of the water, in the three years whose results are fullest (1876, 1885-6 and 1888.) Similar diagrams (not reproduced) have been prepared for all the years of Table V, by plotting the separate results in a similar manner. A curve showing the variation in the total monthly flow of the river is added to the diagrams, the figures being given in Table II. There are indications that the proportional amounts of chlorine and of nitrogen in nitrates increase with an increase of flow in the stream, and that there is a decrease in the proportional amounts of albuminoid ammonia, total solids, and hardness, with such increase of flow. The indications are probably not so strong as they would be if the period of the curve showing variation of flow had the same number of days as those showing the variation in amount of impurities. Data regarding flow of river in sufficient detail to reduce the length of the period were not at hand.

At the present time estimations of chlorine, organic and volatile matter, and mineral matter are made daily. Once a week a more complete analysis of the water is made. In Table V the results for 1888 are those of these weekly analyses.

The following is from Professor Waller:

"I present herewith the results of the examinations of the Croton water for a number of years. The complete analyses of the water, at the time of, or soon after its introduction in 1843, possess an interest that is more of historical than of sanitary importance. A series of examinations were made by Dr. C. F. Chandler when chemist to the Metropolitan board of health, during the summer and later months of 1867, '68, '69. During 1870 and 1871, so far as I am aware, no examinations of the Croton water were made. In 1872, under orders from the board of health, I began a series of weekly examinations of the Croton water, which was continued for nearly seven years. Subsequent to the middle of 1879 the Croton water was examined with more or less frequency, either by myself personally or

under my personal direction and supervision, until the middle of 1886. I know that more examinations have been made than appear from the tables submitted, but unfortunately some note-books or other records of the results have been mislaid or lost, so that the record is more fragmentary than it should be. The results for 1887 and the table for 1888 are collated from the reports of the chemist to the board of health, Mr. E. W. Martin. Since January, 1888, those examinations have been made daily, the results being published every week in the *City Record.*

"I am also able to communicate a few of the results obtained by Dr. Chandler in 1868, and by myself in 1885, on some samples taken in the Croton water-shed.

"In some of the tables are given results obtained on samples taken nearly at the same time in different parts of the city, which are interesting as showing the degree of uniformity in the quality of the supply at different places.

Tests Applied.

"The *color* of the water has been usually a faint shade of green, yellow or brown.

"The *odor*, except at infrequent intervals, has been practically *nil.*

"Tests have been made for *phosphates* and *nitrates* since 1880, but the results have been uniformly negative, and hence I have not cumbered the tables with the record.

"The *chlorine* was determined by the use of a standard solution of silver nitrate. Its *equivalent in sodium chloride* is also recorded.

"The *nitrogen in nitrates* was determined by treatment of some of the water with zinc coated with a film of copper. This couple, by galvanic action, evolved hydrogen. By this means the nitrogen in nitrates was converted into ammonia and thus estimated.

"*Free ammonia* was obtained by distilling half a litre of the water with solution of sodium carbonate, and estimating the ammonia in the distillate.

"*Albuminoid ammonia* was determined by a similar distillation of another half litre of water with potassium permanganate and potash. This gave 'total ammonia.' Then by deducting the amount of 'free ammonia' the figure for albuminoid ammonia was obtained. Some chemists use a different method; e. g., using a smaller quantity of water, and distilling nearly to dryness, which gives results not comparable with the method above outlined.

"*Hardness* as recorded gives the soap-destroying power of the water, the tests having been made with a weak alcoholic solution of soap. The hardness of a water is chiefly due to lime salts, though other than lime compounds contribute to it. For the sake of uniformity, it is customary to record it in terms of carbonate of lime, e. g., a water of three degrees of hardness has the same soap-destroying power as distilled water containing three parts in 100,000 of carbonate of lime.

"*Organic and volatile matter*, *mineral matter*, and *total solids* (by evaporation) are the record of a single set of operations. A measured quantity of the water is evaporated and the residue weighed. The result is recorded as '*Total Solids.*' The evaporation has however decomposed the bi-carbonates (leaving mono-carbonates), and a portion of the organic substance originally present may have escaped with the aqueous vapor. The residue is then heated to redness over the lamp. This burns off organic matter chiefly, but at the same time may volatilize partially or entirely some of the mineral substances present. The loss is recorded as '*Organic and Volatile Matter,*' and what remains as '*Mineral Matter.*' The duration and intensity of the heat applied will cause noticeable differences in the results obtainable for the last two items, so that their significance is not great. Some chemists regard them as so crude an indication of the quality of the water that they do not ignite the residue, but record simply '*Total Solids.*'

"The tests marked '*Oxygen Required*' were made from 1867 to 1879 by W. A. Miller's method — addition of small amounts of potassium permanganate to the acidified water, until no percep-

tible absorption of oxygen (and consequent destruction of the permanganate) occurred in half an hour at ordinary temperatures.

"The few tests made in subsequent years, recorded as '*Tidy's Test,*' were by the method proposed by Dr. C. M. Tidy—adding an excess of potassium permanganate to the acidified water, and after a definite lapse of time, as recorded, determining the amount of undecomposed permanganate remaining. The two methods do not give results which are comparable with each other.

"The use of these tests for the amount of oxygen absorbed has been abandoned for the following reasons: Several different modes of making the test are (or were) in use, and the results by different methods are not comparable with each other. Moreover, the interpretation of the results is uncertain. My own experiments with both Tidy's and Miller's methods or others have shown that the amount of oxygen absorbed is often low in waters known to be contaminated, and sometimes the reverse has been the case.

Significance of the Tests.

"In judging of the quality of a water, the most important question is whether it is contaminated with animal matter, either the excreta of living beings or the products of the decomposition of their dead bodies. To all intents, all of the substances on the list are not only in themselves harmless, but also exist naturally to some extent in waters of the best quality obtainable. Sewage, which may be taken as the representative of the contamination referred to, contains considerable amounts of chlorides, of lime salts, and of mineral matters generally, represented by *Chlorine*, *Hardness* and *Total Solids* in Table V. It also contains considerable proportions of nitrogenous substances. Of the proportion of these we are forced to judge by the products of their partial decomposition. Organic substances containing nitrogen, especially those of animal origin, on decomposing when exposed to the ordinary influences of heat, light and moisture, give up a considerable pro-

portion of their nitrogen in the form of ammonia. Some, as urea, decompose comparatively rapidly, while others (albuminoids, etc.) are more slow. If, however, water containing putrescent nitrogenous matter is caused to percolate through the soil, much of the nitrogen which might otherwise have formed ammonia is converted into the form of nitrate, and sometimes in contaminated waters we may detect the intermediate stage — nitrites.

"Hence, in testing a water, examinations are made for *free ammonia* (sometimes called 'ureal ammonia'), to discover whether much nitrogenous material which has decomposed, or is in process of decomposition, is present; also for *albuminoid ammonia*, which by an artificial hastening of the process of decomposition will serve to indicate whether there is present much material capable of such decomposition, and also for *nitrates* and *nitrites*, to determine whether there is probably in the water nitrogenous material in process of such changes as are induced by percolation through the soil. Sewage, unless it comes in contact with the soil, contains little or no nitrates and nitrites, but shows large quantities (comparatively speaking) of free and albuminoid ammonia. Wanklyn and some other authorities have asserted that when the nitrogen has reached the condition of nitrate all danger from contamination is passed, but cases which are constantly brought to the attention of water analysts show that this view is untenable.

Comparison of Results.

"The records of the last twenty years are, as has been said, fragmentary, and in considering them two points must be borne in mind; one, that the proportions of the constituents of the water vary with the season; the other, that for some of the years the results given in the tables of comparison are averaged on a limited number of examinations, so that the figures taken as a whole show more properly the variations to

which the water has been subject, and hence some discrimination must be used in comparing them.

"First as to mineral constituents. In order to compare what fairly represent yearly averages, we may take for *chlorine*,

Average for 1876	0.210
Average for last half of 1885 and first half of 1886	0.280
Average for 1888	0.202

"These figures would go to show that the water was probably about the same in '88 as in '76, but had been somewhat inferior in 1885–'86.

"For *hardness* we may compare

1873	3.395
1874	3.332
1875	3.293
1876	3.159
1877	3.260
1878	2.846
Last half of 1885 and first half of 1886	3.832
1888	3.699

"With the exception of 1885–'86, the result for 1888 is the highest, indicating a deterioration since 1873, though the water is better for 1888 than a few years previous.

"For *total solids* we may compare

1873	7.82
1874	7.59
1875	7.491
1876	7.094
1877	7.426
1878	7.203
Last half of 1885 and first half of 1886	7.315
1888	6.812

"A tolerably regular decrease seems to have taken place since 1873. As judged by these figures, it cannot be said that the water has declined in quality.

"Turning now to the nitrogenous constituents. The data only afford a satisfactory comparison between the complete years 1885–'86 and 1888. The results for 1881 and 1882 are, however

averaged on examinations, which, though few in number, were tolerably well scattered through those years, and they therefore may serve for comparison, with some reserve. The comparison would then stand:

	Nitrogen in nitrates.	Free ammonia.	Albuminoid ammonia.
1881 (partial)	0.0189	0.0015	0.0117
1882 "	0.0214	0.0018	0.0132
1885–'86	0.0457	0.0023	0.0088
1888	0.0452	0.0005	0.0078

"As in the cases of hardness and chlorine, the results of 1885-6 indicate a more unsatisfactory condition of the water at that time than more recently. The tests made in 1881 and 1882 were chiefly in the warmer months of the year, when the ammonias are, as a rule, higher, and the nitrates lower than in the colder months.

"The *nitrates* are more than doubled in the later years, the increase being far more than could reasonably be allowed under the circumstances for the difference of season. An examination of the details of the examinations given in Table V for different years shows that at present 0.02 for nitrogen is exceptionally small, whereas, previously, 0.04 was an exceptionally high figure.

"*Free ammonia* has also increased in 1885-6, in spite of the difference due to season, though it diminished materially in 1888.

"*Albuminoid ammonia* is about the same in 1885-6 as in 1881 or 1882, if we allow for the difference due to season, though it has slightly decreased in 1888.

Examination of Samples Taken Within the Croton Water-shed.

"For the purposes of comparison the data afforded by Dr. Chandler's results in 1868, and my own in 1885, are insufficient. Taking my examinations of 1885 by themselves, the quality of the water of Titicus river (near the condensed milk factory) was unsuitable for use, while at the dam and in Cross river it was at that time fair, though not thoroughly satisfactory in quality.

TABLE V — Results of Analyses of Croton Water.

Results calculated for 100,000 *parts of water.*

COMPLETE ANALYSES OF CROTON WATER.	Analyst, Prof. J. C. Booth.	Analyst, Dr. J. R. Chilton.		Analyst, C. F. Chandler.		Analyst, E. Waller.	
	1.	2.	3.	4.	5.	6.	7.
	1843.	1843.	Aug., 1859.	Sum'r, 1869.	May, 1872.	May, 1879.	Nov., 1881.
Sodium Chloride	......	0.629	0.577	0.690	0.487	0.351	0.351
Calcium Sulphate	......		0.504	0.272	0.041	1.239	....
Alkaline Chlorides	0.276	......	......	......	......	......	....
Potassium Sulphate	......	......	......	0.309	0.351	0.322	0.345
Sodium Sulphate	......	......	......	0.449	0.011	0.343	0.371
Alkaline Carbonates	1.183	......	0.386	......	......	......	0.092
Magnesium Chloride	......	1.286	0.210	......	......	......	....
Calcium Chloride	......		0.149	......	......	......	....
Magnesium Carbonate	1.341	1.200	0.557	(1.888)	(1.320)	1.575	1.174
Calcium Carbonate	3.276	2.171	0.194	(2.826)	(2.467)	2.830	2.262
Magnesium Bicarbonate	......	......	......	3.280	2.294	......	....
Calcium Bicarbonate	......	......	......	4.578	3.996	......	....
Ferric and Aluminic Oxides	0.157		0.243	Trace	0.100	0.300	0.078
Silica	0.513	0.657		1.060	0.380	0.470	3.360
Organic and Volatile	0.394		1.309	1.150	1.500	0.960	0.400
Total	......	......	5.129	11.788	9.190	......	....
Solids by evaporation	7.140	5.943	5.293	8.200	6.600	8.390	5.432
Chlorine	......	......	0.508	0.416	0.294	0.213	0.213

Nos. 1 and 2, From Illustrations of the Croton Aqueduct. F B. Tower, N. Y., 1843. P. 135.
No. 3. Report of Water Commissioners of Albany for 1865. P. 50.
Nos. 4 and 5. Report of Board of Health for 1871. New York. P. 371.
No. 6. Report on Croton Water. New York, 1881. P. 45.
The entire table is extracted from a pamphlet, "The Water Supply of the City of New York." By E. Waller, Ph. D.

Sources of the Croton Water Supply.

Results of Dr. C. F. Chandler, 1868.

No.	SOURCE OF WATER.	Inorg.	Org. and vol.	Total.	Oxygen required.
1..	Beaver dam brook, near Katonah	8.03	0.78	8.84	0.1620
2..	Cross river, near Katonah	6.13	0.65	6.78	0.1512
3	Croton river, main stream, one mile west of Katonah station	6.25	0.68	6.93	0.1080
4..	Titicus river, near Purdy's station	9.19	1.22	10.41	0.1404
5	Croton river, West Branch, near bridge at Croton Falls	5.62	1.03	6.65	0.1188
6..	Croton river, East Branch, at Croton Falls	9.20	1.13	10.33	0.1242
7..	Croton river, East Br., near DeForest's Cor.	9.83	1.19	10.92	0.1350
8..	New dam, reservoir E	5.20	1.21	6.41	0.1901
9..	White Pond b'k or Wright's b'k near res. E.	5.43	0.86	6.29	0.0972
10..	Black Pond brook, near reservoir E	4.81	1.08	5.89	0.2376
11..	Black pond	4.83	1.67	6.50	0.3456
12..	Cold Spring brook flowing into Black pond.	2.06	1.83	3.89	0.4320
13..	White pond, one mile above Millerton	3.32	1.51	4.83	0.1404
14..	Gleneida pond outlet	5.40	0.92	6.32	0.1620
15..	Muscoot creek, near the head of Croton lake,	8.06	0.89	8.95	0.1404
16..	Croton lake at its head	7.41	1.16	8.57	0.1512
17..	Kisco brook at Croton lake	6.43	0,89	7.32	0.1890
18..	Croton lake at the dam	7.42	1.13	8.55	0.2322
	Average of the eighteen samples	6.36	1.10	7.46	0.1809
	Average for the summer in the city	5.66	1.97	7.63	0.1680

Third Annual Report of the Metropolitan Board of Health, 1868, Table V., p. 469.

TABLE V — (*Continued*).

EXAMINATIONS OF CROTON WATER, SUMMER OF 1867 — (Parts per 100,000).

Results of Dr. C. F. Chandler.

DATE.	Source of water.	Inorg.	Org. and vol.	Total.	Hard-ness.	Oxygen required.
1867.						
June 28*	Seenote*	5.50	0.60	6.10	4.00	0.1908
July 8*	....	6.18	0.85	7.03	......	0.1757
July 19	....	5.70	1.37	7.07	4.10	0.1744
July 25	....	6.18	1.22	7.40	4.36	0.1892
August 1	....	7.08	1.04	8.12	4.25	0.1931
August 8	....	6.27	1.72	7.99	4.27	0.1942
August 15	....	6.52	1.83	8.35	4.30	0.2155
August 22	....	6.23	1.22	7.45	4.07	0.2155
August 29	....	6.97	0.97	7.94	4.24	0.1933
Sept. 5	....	6.85	1.55	8.40	4.34	0.1794
Sept. 12	....	6.79	1.26	8.05	4.48	0.1478
Sept. 19	....	7.08	0.89	7.97	4.34	0.2042
Sept. 26	....	6.78	1.02	7.80	4.53	0.1959
October 4	....	7.40	0.22	7.59	4.43	0.1241
October 10	....	7.28	0.58	7.85	4.49	0.1280
Average for 13 weeks		6.72	1.12	7.84	4.32	0.1809

*The water examined June 28 and July 8 was taken *only* from the hydrant at the School of Mines, Columbia college. The figures given for the other dates are the averages of results obtained on three separate samples drawn on the days designated — one from the hydrant at the School of Mines, another from the Fifth Avenue reservoir, and a third from the Central Park reservoir.

Second Annual Report of the Metropolitan Board of Health, 1867. Table C, Nos. I and II, pp. 398 and 399.

EXAMINATIONS OF CROTON WATER, SUMMER OF 1868.

Results of Dr. C. F. Chandler.

DATE.	Source of water.	Inorg.	Org. and vol.	Total.	Hard-ness.	Oxygen required.
1868.						
July 23	Hydrant, School of Mines	6.25	2.01	8.26	......	... .
July 23	Reservoir, Fifth avenue	7.25	2.12	9.37	......	....
Aug. 6	Hydrant, School of Mines	6.22	2.13	8.35	......	0.125
Aug. 6	Reservoir, Fifth avenue	5.72	2.60	8.12	......	0.142
Aug. 19	Hydrant, School of Mines	5.22	2.10	7.32	......	0.142
Aug. 19	Reservoir, Fifth avenue	5.40	1.69	7.09	......	0.171
Sept. 2	Hydrant, School of Mines	5.55	1.70	7.25	......	0.183
Sept. 2	Reservoir, Fifth avenue	5.04	2.36	7.40	......	0.171
Sept. 17	Hydrant, School of Mines	5.31	1.70	7.01	......	0.171
Sept. 17	Reservoir, Fifth avenue	5.60	1.80	7.40	......	0.206
Oct. 1	Hydrant, School of Mines	5.40	1.91	7.31	......	0.183
Oct. 1	Reservoir, Fifth avenue	4.98	1.70	6.68	......	0.183
Average for three months		5.66	1.97	7.63	......	0.168

Third Annual Report of the Metropolitan Board of Health, 1868, Table II., p. 468.

TABLE V — (*Continued*).

Examinations of Croton Water, Last Half of 1869 — (Parts per 100,000).

Results of Dr. C. F. Chandler.

DATE.	Source of water.	Inorg.	Org. and vol.	Total.	Hard-ness.	Oxygen required.
1869.						
July 6....	See note below.	7.50	1.10	8.60	4.235	0.1390
July 13....	....	7.60	1.20	8.80	4.425	0.1345
July 20....	....	6.30	1.35	7.65	5.605	0.1307
July 27....	....	7.35	0.95	8.30	5.630	0.1060
Aug. 3....	....	7.65	0.60	8.25	4.785	0.1059
Aug. 13....	....	6.85	0.80	7.65	6.050	0 0984
Aug. 17...	....	5,90	1.80	7.70	5.770	0.0794
Aug. 24....	....	7.35	0.50	7.85	5.870	0.0733
Aug. 31....	....	6.55	1.50	8.05	6.210	0.0798
Sept. 7....	....	8.45	0.35	8.80	6.210	0.0775
Sept. 14....	....	7.00	1.65	8.65	6.410	0.0737
Sept. 28....	....	8.50	3.00	11.50	6.330	0.0927
Oct. 12....	....	6.80	2.20	9.00	4.880	0.1475
Oct. 26....	....	8.15	0.55	8.70	4.840	0.1418
Nov. 9....	....	7.10	0.75	7.85	4.995	0.1210
Nov. 23....	....	6.70	0.70	7.40	4.700	0.1248
Dec. 8....	....	5.55	1.55	7.10	4.515	0.1191
Dec. 21....	....	5.70	0.20	5.90	4.545	0.0945
Average for six months.............		7.07	1.15	8.20	5.360	0.1074

Each figure represents the average of results obtained on two samples drawn on the days specified — one from the Fifth Avenue reservoir, the other from the Central Park reservoir.

Fourth Annual Report of the Metropolitan Board of Health, 1869. Table III, p. 417.

Examination of Croton Water, 1872.

DATE.	Inorg.	Org. and vol.	Total.	Hard-ness.	Oxygen required.
1872.					
May 11*..................................	5.00	1.6	6.6	......	....
Nov. 11†..................................	8.43	0.60	9.03	3.686	0.1860
Nov. 19..................................	7.35	0.85	8.20	3.200	0.1608
Nov. 22..................................	7.00	0.52	7.52	3.400	0.2000
Nov. 30..................................	8.00	0.20	8.20	3.076	0.1250
Dec. 6..................................	7.60	0.20	7.80	3.807	0.0853
Dec. 14..................................	7.56	0.04	7.60	4.800	0.1210
Dec. 21..................................	7.00	0.60	7.60	3.300	0.1250
Dec. 28..................................	6.60	0.80	7.40	4.539	0.1025
Average, excluding that of May.....	7.44	0.48	7.92	3.726	0.1356

* Second Annual Report of the Board of Health, 1871. Report of Dr. C. F. Chandler, p. 371.

† The results for November 11, and subsequently, are taken from the Third Annual Report of the Board of Health, 1872. Report by E, Waller, A. M., etc. P. 296.

TABLE V — (*Continued*).

Examinations of Croton Water, 1873 — (Parts per 100,000).

DATE.	Inorg.	Org. and vol.	Total.	Hard-ness.	Oxygen required.
1873.					
Jan. 4	7.20	0.80	8.00	3.46	0.120
Jan. 11	7.20	1.00	8.20	3.16	0.087
Jan. 18	5.00	2.20	7.20	2.80	0.102
Jan. 25	4.60	1.00	5.60	2.80	0.085
Feb. 1	6.40	0.60	7.00	2.60	0.085
Feb. 8	6.40	0.80	7.20	2.90	0.102
Feb. 15	5.40	1.40	6.80	3.16	0.154
Feb. 22	6.28	1.00	7.28	3.16	0.094
Mar. 1	5.80	1.60	7.40	3.40	0.094
Mar. 8	6.20	1.40	7.60	3.40	0.085
Mar. 15	7.20	1.20	8.40	3.16	0.085
Mar. 22	6.80	1.40	8.20	3.00	0.085
Mar. 29	6.20	1.40	7.60	2.88	0.145
April 5	5.40	1.40	6.80	2.88	0.085
April 12	4.80	1.60	6.40	2.88	0.120
April 19	4.60	1 20	5.80	2.74	0.128
April 26	4.20	1.60	5.80	2.89	0.171
May 3	5.80	0.60	6.20	3.15	0.136
May 10	4.80	1.80	6.60	2.89	0.102
May 17	5.80	1.20	7.00	2.89	0.128
May 24	5.80	1.60	7.40	3.15	0.145
May 31	5.80	1.20	7.00	3.42	0.128
June 7	5.80	1.60	7.40	3.42	0.145
June 14	6.20	1.20	7.40	3.68	0.180
June 21	5.40	4.40	9.80	3.68	0.180
June 28	6.60	2.00	8.60	3.94	0.133
July 5	7.20	1.60	8.80	3.94	0.116
July 12	6.00	2.00	8.00	3.94	0.107
July 19	5.80	1.80	7.60	3.68	0.089
July 26	5.60	1.20	6.80	3.68	0.133
Aug. 2	4.60	2.00	6.60	3.68	0.116
Aug. 9	4.60	1.60	6.20	3.42	0.125
Aug. 16	6.00	2.40	8.40	3.16	0.116
Aug. 23	7.20	1.40	8.60	3.42	0.116
Aug. 30	6.40	1.60	8.00	3.42	0.180
Sept. 20	6.00	2.20	8.20	3.608	0.217
Sept. 27	7.80	1.60	9.40	4.123	0.173
Oct. 4	8.00	1.40	9.40	3.865	0.148
Oct. 11	6.60	1.60	8.20	3.865	0.165
Oct. 18	7.60	1.80	9.40	3.865	0.200
Oct. 25	7.40	2.60	10.00	3.865	0.173
Nov. 1	8.00	2.40	10.40	3.608	0.217
Nov. 8	7.20	2.40	9.60	3.608	0.217
Nov. 15	8.00	2.60	10.60	3.350	0.252
Nov. 22	6.80	2.00	8.80	3.608	0.191
Nov. 29	7.40	1.60	9.00	3.350	0.144
Dec. 6	6.80	1.40	8.20	3.092	0.107
Dec. 13	6.60	1.40	8.00	3.092	0.144
Dec. 20	5.80	1.20	7.00	2.834	0.167
Dec. 27	5.60	1.40	7.00	2.834	0.119
Average for 1873	6.23	1.59	7.82	3.395	0.135

Third Report of Board of Health, p. 296, and Fourth Report of Board of Health, p. 453.

TABLE V—(*Continued*).

Examinations of Croton Water, 1874—(Parts per 100,000).

DATE.	Free ammonia.	Albuminoid ammonia.	Inorg.	Org. and vol.	Total.	Hardness.	Oxygen required.
1874.							
Jan. 3	....	....	5.80	1.40	7.20	2.834	0.095
Jan. 10	....	....	5.60	1.40	7.00	2.834	0.135
Jan. 17	....	....	5.60	2.00	7.60	2.320	0.119
Jan. 24	....	....	5.00	1.40	6.40	2.834	0.107
Jan. 31	....	....	6.00	0.40	6.40	2.576	0.095
Feb. 7	....	....	6.00	1.40	7.40	2.834	0.119
Feb. 14	....	....	6.80	1.40	8.20	2.834	0.071
Feb. 21	....	....	6.60	1.40	8.00	2.834	0.083
Feb. 28	....	....	5.20	1.80	7.00	2.834	0.083
Mar. 7	....	....	4.80	1.60	6.40	2.834	0.113
Mar. 14	....	....	5.20	1.80	7.00	2.576	0.095
Mar. 21	....	....	5.40	1.40	6.80	2.834	0.144
Mar. 28	....	....	4.60	1.40	6.00	2.834	0.144
April 4	....	....	5.60	1.40	7.00	2.834	0.095
April 11	....	....	5.80	1.00	6.80	3.743	0.131
April 18	....	....	5.40	1.40	6.80	3.208	0.144
April 25	....	....	4.80	1.40	6.20	3.743	0.117
May 2	....	....	5.80	1.40	7.20	3.208	0.117
May 9	....	....	5.60	2.40	8.00	2.931	0.131
May 16	....	....	5.00	1.60	6.60	2.673	0.145
May 23	....	....	4.40	2.00	6.40	2.673	0.131
May 30	....	....	5.60	1.80	7.40	3.208	0.117
June 6	....	....	5.80	2.00	7.80	3.208	0.181
June 13	....	....	6.20	1.40	7.60	3.208	0.175
July 4	....	....	7.40	2.20	9.60	4.010	0.157
July 11	....	....	6.20	2.20	8.40	4.010	0.168
July 18	....	....	6.40	2.00	8.40	3.743	0.262
July 25	....	....	6.00	1.60	7.60	3.743	0.336
Aug. 1	....	....	6.00	1.80	7.80	3.743	0.292
Aug. 8	....	....	6.60	1.80	8.40	4.010	0.234
Aug. 15	0.001	0.0145	6.60	2.00	8.60	4.010	0.292
Aug. 22	0.001	0.015	6.60	1.60	8.20	3.743	0.350
Aug. 29	0.0007	0.0147	6.20	2.20	8.40	3.743	0.304
Sept. 5	....	....	6.60	2.00	8.60	4.040	0.272
Sept. 12	....	....	6.40	1.80	8.20	3.830	0.198
Sept. 19	....	....	5.00	2.20	7.20	3.617	0.198
Sept. 26	....	....	5.60	1.60	7.20	3.404	0.185
Oct. 3	....	....	5.00	1.20	6.20	3.404	0.189
Oct. 10	....	....	5.40	2.68	8.08	3.404	0.220
Oct. 17	....	....	5.12	1.96	7.08	3.617	0.198
Oct. 24	....	....	6.20	2.00	8.20	3.404	0.194
Oct. 31	....	....	5.40	3.00	8.40	3.617	0.212
Nov. 7	....	....	6.60	2.80	9.40	3.617	0.185
Nov. 14	....	....	6.40	1.60	8.00	3.830	0.145
Nov. 21	....	....	6.40	1.80	8.20	3.830	0.121
Nov. 28	....	....	5.60	2.40	8.00	3.617	0.129
Dec. 5	....	....	6.60	1.40	8.00	3.617	0.121
Dec. 12	....	....	6.00	2.00	8.00	3.617	0.145
Dec. 19	....	....	6.20	1.80	8.00	3.617	0.185
Dec. 26	... .	....	6.40	1.60	8.00	3.404	0.129
Average for 1874	....	....	5.83	1.76	7.59	3.332	0.166

TABLE V — (*Continued*).

EXAMINATIONS OF CROTON WATER, 1875 — (Parts per 100,000).

DATE.	Inorg.	Org. and vol.	Total.	Hard-ness.	Oxygen required.
1875.					
Jan. 2	6.00	1.80	7.80	3.617	0.081
Jan. 9	6.20	1.40	7.60	3.494	0.121
Jan. 16	6.00	2.20	8.20	3.494	0.121
Jan. 23	6.20	1.40	7.60	3.494	0.162
Jan. 30	6.20	2.60	7.80	3.494	0.145
Feb. 6	5.00	1.20	6.20	3.225	0.081
Feb. 13	4.60	1.80	6.40	2.150	0.185
Feb. 20	4.00	1.40	5.40	1.882	0.217
Feb. 27	3.40	1.60	5.00	2.150	0.209
Mar. 6	3.20	1.60	4.80	2.150	0.354
Mar. 13	3.60	2.00	5.60	1.882	0.322
Mar. 20	3.60	1.80	5.40	2.150	0.161
Mar. 27	3.20	1.80	5.00	2.150	0.161
April 3	3.80	2.00	5.80	2.150	0.129
April 10	4.00	1.00	5.00	2.150	0.217
April 17	3.60	1.80	5.40	2.419	0.185
April 24	4.20	1.80	6.00	2.419	0.217
May 1	4.20	1.80	6.00	2.688	0.217
May 8	5.40	1.00	6.40	2.688	0.209
May 15	4.80	1.60	6.40	2.956	0.207
May 22	5.20	1.80	7.00	3.225	0.200
May 29	5.40	1.80	7.20	3.494	0.215
June 5	7.00	1.80	8.80	3.763	0.215
June 12	6.60	1.80	8.40	3.763	0.153
June 19	6.80	2.00	8.80	3.763	0.168
June 26	6.80	2.40	9.20	3.763	0.183
July 3	6.40	2.40	8.80	4.032	0.200
July 10	6.20	2.40	8.60	4.032	0.261
July 17	5.80	2.80	8.60	3.763	0.200
July 24	5.76	1.96	7.72	3.494	0.218
July 31	6.00	2.00	8.00	3.494	0.200
Aug. 7	5.60	2.00	7.60	3.225	0.230
Aug. 14	5.92	2.00	7.92	3.441	0.261
Aug. 21	5.28	2.24	7.52	3.225	0.308
Aug. 28	4.92	2.24	7.16	3.225	0.383
Sept. 4	6.02	1.78	7.80	3.494	0.308
Sept. 11	6.88	2.32	9.20	3.763	0.293
Sept. 18	6.76	2.12	8.88	3.763	0.323
Sept. 25	7.32	1.84	9.16	3.763	0.200
Oct. 2	7.44	1.84	9.28	3.763	0.200
Oct. 9	7.12	1.96	9.08	3.763	0.220
Oct. 16	7.64	1.56	9.20	3.763	0.169
Oct. 23	7.36	1.76	9.12	4.581	0.153
Oct. 30	6.92	1.72	8.64	3.644	0.220
Nov. 6	7.44	2.16	9.60	4.163	0.206
Nov. 13	6.96	1.76	8.72	4.214	0.184
Nov. 20	7.00	1.60	8.60	3.989	0.231
Nov. 27	6.48	1.72	8.20	4.120	0.262
Dec. 4	6.20	1.68	7.88	4.077	0.296
Dec. 11	5.60	1.60	7.20	3.225	0.222
Dec. 18	4.96	2.48	7.44	3.170	0.236
Dec. 25	5.12	1.28	6.40	3.494	0.181
Average for 1875	5.656	1.835	7.491	3.293	0.211

Fifth and Sixth Reports of the Board of Health, 1874-5, pp. 645 *et seq.*

TABLE V— (*Continued*).

Examinations of Croton Water, 1876— (Parts per 100,000).

DATE.	Chlorine.	Inorg. matter.	Organic and volatile.	Total solids.	Hard-ness.	Oxygen absorbed.
1876.						
Jan. 1	....	5.80	1.36	7.16	3.713	0.16
Jan. 8	....	5.24	1.28	6.52	3.494	0.19
Jan. 15	0.324	5.16	1.96	7.12	3.709	0.19
Jan. 22	0.294	6.56	1.36	7.92	4.193	0.19
Jan. 29	0.269	5.85	2.15	8.00	3.494	0.13
Feb. 5	0.249	6.50	1.30	7.80	3.225	0.14
Feb. 12	0.253	4.60	2.64	7.24	3.494	0.14
Feb. 19	0.249	4.36	2.96	7.32	2.419	0.13
Feb. 26	0.233	5.08	0.92	6.00	2.419	0.13
Mar. 4	0.233	4.32	1.36	5.68	2.419	0.16
Mar. 11	0.333	5.24	1.00	6.24	2.686	0.13
Mar. 18	0.333	5.76	1.04	6.80	2.688	0.13
Mar. 25	0.186	5.00	0.96	5.96	2.419	0.16
April 1	0.200	4.00	1.44	5.44	2.150	0.13
April 8	0.200	4.44	1.08	5.52	2.150	0.13
April 15	0.167	3.88	1.12	5.00	2.150	0.19
April 22	0.179	4.24	1.36	5.60	2.312	0.13
April 29	0.183	4.20	1.40	5.60	2.419	0.13
May 6	0.179	......	......	6.20	2.957	0.15
May 13	0.162	4.96	1.16	6.12	2.688	0.19
May 20	0.146	5.20	1.52	6.72	2.957	0.25
May 27	0.158	5.40	1.24	6.64	2.957	0.20
June 3	0.183	5.72	1.60	7.32	3.226	0.27
June 10	....	6.00	1.64	7.64	3.226	0.25
June 17	0.171	4.80	2.20	7.00	3.494	0.25
June 24	0.162	5.92	1.60	7.52	3.494	0.23
July 1	0.208	6.60	1.08	7.68	3.684	0.17
July 8	0.175	5.92	1.64	7.56	3.737	0.174
July 15	....	5.96	1.16	7.12	3.842	0.164
July 22	0.158	4.84	2.60	7.44	3.421	0.223
July 29	0.141	5.04	2.12	7.16	2.211	0.214
Aug. 5	0.169	6.40	1.40	7.80	3.158	0.204
Aug. 12	0.183	6.32	1.24	7.56	3.158	0.200
Aug. 19	0.162	5.84	1.64	7.48	3.000	0.184
Aug. 26	0.145	4.80	2.60	7.40	3.158	0.209
Sept. 2	0.194	5.24	1.40	6.64	3.000	0.174
Sept. 9	0.175	4.60	1.60	6.20	2.894	0.154
Sept. 16	0.175	5.16	2.12	7.28	3.000	0.163
Sept. 23	0.208	4.56	1.92	6.48	2.894	0.163
Sept 30	0.191	5.28	1.52	6.80	2.894	0.143
Oct. 7	0.166	4.72	1.92	6.64	2.947	0.153
Oct. 14	0.200	4.80	1.72	6.52	3.158	0.163
Oct. 21	0.225	5.44	1.80	7.24	3.158	0.163
Oct. 28	0.208	5.72	2.16	7.88	3.316	0.143
Nov. 4	....	6.52	1.00	7.52	3.590	0.153
Nov. 11	0.205	5.96	1.52	7.48	3.590	0.120
Nov. 18	0.183	5.92	1.72	7.64	3.867	0.165
Nov. 25	0.158	6.16	1.88	8.04	3.702	0.202
Dec. 2	0.266	5.96	2.28	8.24	3.590	0.180
Dec. 9	....	6.28	2.84	9.12	3.530	0.317
Dec. 16	0.266	6.08	2.64	8.72	3.590	0.262
Dec. 23	....	7.40	1.36	8.76	3.867	0.212
Dec. 30	0.250	5.60	2.92	8.52	3.867	0.172
Average	0.210	5.416	1.682	7.094	3.159	0.185

TABLE V—(*Continued*).

EXAMINATIONS OF CROTON WATER, 1877—(Parts per 100,000).

DATE.	Free ammonia.	Albuminoid ammonia.	Chlorine	Inorg.	Organic and volatile.	Total solids.	Hardness.	Oxygen absorbed.
1877.								
Jan. 6....	....	....	......	7.12	2.00	9.12	3.867	0.162
Jan. 13....	....	....	......	6.56	1.40	7.96	3.646	0.175
Jan. 20....	....	....	0.244	5.28	1.88	7.16	3.315	0.250
Jan. 27....	....	....	......	5.36	2.16	7.52	3.590	0.250
Feb. 3....	....	....	......	6.84	1.28	8.12	3.590	0.250
Feb. 10....	....	....	......	6.08	1.04	7.12	3.315	0.250
Feb. 17....	....	....	......	5.56	1.68	7.24	3.315	0.237
Feb. 24....	....	....	......	5.52	2.24	7.76	3.315	0.250
Mar. 3....	....	....	......	5.16	1.92	7.08	3.315	0.237
Mar. 10....	....	....	......	4.36	2.36	6.72	3.039	0.225
Mar. 17....	....	... .	......	3.64	1.92	5.56	3.039	0.250
Mar. 24....	....	....	......	4.64	1.00	5.64	3.039	0.250
Mar. 31....	....	....	......	3.96	1.44	5.40	2.727	0.272
April 7....	....	....	......	4.08	1.48	5.56	2.727	0.248
April 14....	....	....	......	4.20	1.88	6.08	2.727	0.236
April 21....	....	....	......	4.24	2.20	6.44	3.000	0.213
April 28....	....	....	......	4.56	1.56	6.12	3.000	0.201
May 5....	....	....	......	5.36	1.44	6.80	3.272	0.201
May 12....	....	....	......	5.24	1.08	6.32	3.118	0.225
May 19....	....	....	......	5.52	1.24	6.76	3.381	0.260
May 26....	... .	....	......	5.36	1.56	6.92	3.109	0.225
June 2....	....	....	......	6.12	1.60	7.72	3.545	0.201
June 9....	....	....	......	6.44	2.12	8.56	3.818	0.213
June 16....	....	....	......	6.48	2.12	8.60	3.818	0.213
June 23....	....	....	......	6.36	1.64	8.00	3.818	0.284
June 30....	....	....	......	5.88	2.44	8.32	3.818	0.236
July 7....	....	....	......	6.24	1.64	7.88	3.818	0.201
July 14....	....	....	......	7.12	1.40	8.52	3.818	0.242
July 21....	....	....	......	5.80	2.24	8.04	3.818	0.266
July 28....	....	....	......	5.16	2.32	7.48	3.354	0.298
Aug. 4 ...	....	....	......	5.32	2.44	7.76	3.333	0.316
Aug. 11....	....	....	......	7.25	0.25	7.50	3.777	0.350
Aug. 18 ...	....	....	......	5.15	2.85	8.00	3.888	0.330
Aug. 25....	....	....	......	5.68	2.80	8.48	3.666	0.353
Sept. 1....	....	....	......	5.84	1.88	7.72	3.500	0.333
Sept. 8....	....	....	......	5.72	2.28	8.00	3.444	0.292
Sept. 15....	....	....	......	5.56	2.12	7.68	3.555	0.333
Sept. 22....	....	....	......	6.16	1.12	7.28	3.699	0.316
Sept. 29....	....	....	......	5.88	2.20	8.08	3.456	0.320
Oct. 6....	....	....	......	5.60	1.64	7.24	3.192	0.303
Oct. 13....	....	....	......	5.60	2.92	8.52	2.926	0.211
Oct. 20....	....	....	......	6.20	1.96	8.16	2.669	0.246
Oct. 27....	....	....	......	7.63	3.44	11.07	2.926	0.297
Nov. 3....	....	....	......	6.04	2.12	8.16	2.926	0.352
Nov. 10....	....	....	......	5.88	2.48	8.36	2.766	0.352
Nov. 17....	....	....	......	5.48	1.36	6.84	2.660	0.352
Nov. 24....	0.0008	0.0156	......	5.64	1.08	6.72	2.660	0.268
Dec. 1....	0.001	0.0092	......	5.68	1.28	6.96	2.766	0.194
Dec. 8....	....	....	......	5.08	1.64	6.72	2.660	0.185
Dec. 15....	....	....	......	5.16	1.76	6.92	2.660	0.213
Dec. 22....	....	... .	......	5.08	1.52	6.60	2.554	0.184
Dec. 29....	....	....	......	5.48	1.40	6.88	2.766	0.147
Average,	....	....	......	5.603	1.823	7.426	3.260	0.253

TABLE V — (*Continued*).

EXAMINATIONS OF CROTON WATER, 1878 — (Parts per 100,000).

DATE.	Free ammonia.	Albuminoid ammonia.	Chlorine	Inorg.	Organic and volatile.	Total solids.	Hardness.	Oxygen required.
1878.								
Jan. 7....	0.0019	0.0053	0.295	5.72	1.56	7.28	2.766	0.115
Jan. 14...	....	....	......	6.24	0.92	7.16	2.873	0.101
Jan. 21...	....	....	......	5.52	1.60	7.12	2.873	0.133
Jan. 28....	....	....	......	5.60	1.04	6.64	3.254	0.140
Feb. 2....	....	....	......	5.40	1.24	6.64	2.611	0.135
Feb. 9....	....	....	......	4.96	1.56	6.52	2.364	0.140
Feb. 16....	....	....	......	5.44	0.76	6.20	2.463	0.125
Feb. 23....	....	....	......	5.36	0.84	6.20	2.266	0.140
Mar. 2....	....	....	......	5.36	0.84	6.20	2.315	0.130
Mar. 9....	....	....	......	4.80	0.96	5.76	2.414	0.140
Mar. 16....	....	....	......	4.76	0.88	5.64	1.970	0.140
Mar. 23....	....	....	......	4.40	1.24	5.64	2.167	0.145
Mar. 30....	....	....	......	4.60	1.24	5.84	2.118	0.180
April 6....	....	....	......	4.88	1.16	6.04	2.216	0.132
April 13....	....	....	......	5.36	0.56	5.92	2.315	0.113
April 20....	....	....	......	5.24	1.04	6.28	2.414	0.137
April 27....	....	....	......	5.68	1.40	7.08	2.512	0.147
May 4....	....	....	......	5.52	1.48	7.00	2.462	0.147
May 18....	....	....	......	5.16	1.68	6.84	2.709	0.220
May 25....	....	....	......	5.64	1.12	6.76	2.808	0.216
June 1....	....	....	......	5.68	1.60	7.28	2.946	0.181
June 8....	....	....	......	4.48	2.12	6.60	2.842	0.166
June 15....	....	....	......	4.80	2.44	7.24	2.894	0.152
June 22....	....	....	......	4.32	3 24	7.56	3.049	0.188
June 29....	....	....	......	3.40	3.56	6.96	2.945	0.159
July 6....	....	....	......	2.96	4.36	7.32	2.997	0.224
July 13....	....	....	......	2.84	3.24	6.08	2.945	0.202
July 20....	....	....	......	4.24	3.52	7.76	3.152	0.195
July 27....	....	....	......	4.48	3.60	8.08	3.178	0.181
Aug. 3....	....	....	......	4.28	4.00	8.28	3.152	0.193
Aug. 10....	....	....	......	3.64	4.72	8.36	3.178	0.209
Aug. 17....	....	....	......	3.76	4.68	8.44	3.330	0.239
Aug. 24....	....	....	......	4.32	4.36	8.68	3.385	0.265
Aug. 31....	....	....	......	4.72	4.32	9.04	3.462	0.244
Sept. 7....	....	....	......	3.44	4.64	8.08	2.968	0.214
Sept. 14....	....	....	......	6.04	1.36	7.40	3.125	0.326
Sept. 21....	....	....	......	6.28	1.76	8.04	3.020	0.302
Sept. 28....	....	....	......	7.04	1.32	8.36	3.177	0.289
Oct. 5....	....	....	......	7.16	1.16	8.32	3.229	0.329
Oct. 12....	....	....	......	7.16	1.20	8.36	3.333	0.329
Oct, 19....	....	....	......	7.52	1.44	8.96	3.177	0.250
Oct. 26....	....	....	......	7.16	1.20	8.36	3.125	0.243
Nov. 2....	....	....	......	6.48	1.16	7.64	2.968	0.149
Nov. 9....	....	....	......	6.64	1.52	8.16	2.968	0.169
Nov. 16....	0.0015	0.0130	......	7.04	1.40	8.44	3.281	0.156
Nov. 23....	....	....	......	7.32	1.04	8.36	3.385	0.143
Nov. 30....	....	....	......	6.36	0.92	7.28	3.125	0.176
Dec. 7....	....	....	......	5.36	1.68	7.04	3.020	0.155
Dec. 14....	....	....	......	5.08	0.84	5.92	2.760	0.155
Dec. 21....	....	....	......	5.08	0.96	6.04	2.604	0.134
Dec. 29....	....	....	......	5.52	0.64	6.16	2.552	0.113
Average,	....	....	......	5.299	1.904	7.203	2.846	0.183

TABLE V — (*Continued*).

Examinations of Croton Water, 1879 — (Parts per 100,000).

DATE.	Free ammonia.	Albuminoid ammonia.	Chlorine	Inorg.	Organic and volatile.	Total solids.	Hardness.	Oxygen absorbed.
1879.								
Jan. 4....	....	....	......	6.00	1.32	7.32	2.500	0.077
Jan. 11....	....	....	......	7.04	0.60	7.64	2.812	0.067
Jan. 18....	....	....	......	5.92	0.68	6.60	2.968	0.067
Jan. 25....	....	....	......	6.44	1.44	7.88	3.385	0.053
Feb. 1....	....	....	......	6.12	0.40	6.52	2.916	0.047
Feb. 8....	....	....	......	5.36	1.92	7.28	3.020	0.067
Feb. 15....	....	....	......	5.80	0.28	6.08	2.864	0.052
Feb. 22....	....	....	......	4.72	1.04	5.76	2.708	0.054
Mar. 1....	....	....	......	5.12	0.92	6.04	2.767	0.059
Mar. 8....	....	....	......	5.32	0.56	5.88	2.767	0.064
Mar. 15....	....	....	......	5.08	1.04	6.12	2.767	0.064
Mar. 22....	....	....	......	5.40	0.96	6.36	2.715	0.070
Mar. 29....	....	....	......	5.04	1.12	6.16	2.611	0.077
April 5....	0.0045	0.0095	0.295	4.60	0.76	5.36	2.506	0.083
April 12....	....	....	......	5.44	0.64	6.08	2.559	0.056
April 19....	....	....	......	5.08	0.84	5.92	2.559	0.064
April 26....	....	....	......	5.16	0.60	5.76	2.559	0.096
May 3....	....	....	......	4.60	1.08	5.68	2.872	0.020
May 10....	....	....	.....	5.44	0.76	6.20	2.872	0.120
May 17....	....	....	......	5.96	0.68	6.64	3.133	0.136
May 24....	....	....	......	5.92	0.96	6.88	3.499	....
May 31....	....	....	0.213	6.00	1.44	7.44	3.499	....
Av. for 5 mo	....	....	......	5.424	0.912	6.336	2.811	0.072
July 11....	0.0008	0.008	....	....	......	....	......	....

Examinations of Croton Water, 1880.

December 23. Free ammonia, 0.002; albuminoid ammonia, 0.0086.

TABLE V — (*Continued*).

EXAMINATIONS OF CROTON WATER, 1881 — (Parts per 100,000).

DATE.	Chlorine	Equivalent to sodium chloride.	Nitrogen in nitrates, etc.	Free ammonia.	Albu-minoid ammonia.	Hardness before boiling.	Hardness after boiling.	Organic and volatile.	Mineral.	Total solids (evapor-ation).	Oxygen — Tidy's test.	
1881.											2 min.	3 hours.
April 2	......	....	....	None.	0.0130	....	....	......	......	......	......	....
April 4	......	....	....	0.0020	0.0110	....	....	......	......	......	......	....
April 22*	......	....	....	0.0020	0.0120	....	....	1.67	5.66	7.33	......	....
April 23‖	......	....	....	0.0010	0.0140	....	....	......	......	......	......	....
April 25¶	......	....	....	0.0019	0.0106	....	....	Tr.	5.7	5.7	......	....
April 26††	......	....	....	0.0010	0.0095	....	....	......	......	......	......	....
May 16	......	....	....	0.0010	0.0070	....	....	......	......	......	......	....
July 29	......	....	0.0198	0.0010	....	....	....	......	......	......	......	....
Nov. 7	0.212	0.351	....	....	....	2.32	1.54	0.400	6.50	6.90	0.033	0.186
Nov. 9	......	....	0.0181	0.0020	0.0140	....	....	......	......	......	0.0712	0.218
Dec. 20	......	....	....	....	....	....	....	......	......	......	0.160	0.272

Unfiltered Samples.

DATE.	Chlorine	Equivalent to sodium chloride.	Nitrogen in nitrates, etc.	Free ammonia.	Albu-minoid ammonia.	Hardness before boiling.	Hardness after boiling.	Organic and volatile.	Mineral.	Total solids (evapor-ation).	Oxygen — Tidy's test. 2 min.	3 hours.
April 22†	......	....	....		0.0310	....	....	21.0	75.7	96.7	......	....
April 22‡	......	....	....		0.0190	....	....	......	......	......	......	....
April 22§	......	....	....		0.0310	....	....	15.1	69.2	84.3	......	....
April 25**	......	....	....		0.0190	....	....	......	......	......	......	....

The samples of April 22 to 26, inclusive, were marked as follows:
*April 22. This result is the average of filtered specimens of the *five* following:
April 22. No. 985 — Thirty-third street and Broadway.
†April 22. No. 986 — 56 East Thirty-fourth street.
April 22. No. 987 — One Hundred and Fourteenth street, between Lexington and Fourth avenues.
‡April 22. No. 988 — One Hundred and Twenty-first street, between Lexington and Fourth avenues.
§April 22. No. 989 — One Hundred and Thirty-first street and Sixth avenue.
‖April 23. No. 993 — 9 East Thirteenth street.
¶April 25. This result is the average of filtered specimens of the *two* following:
**April 25. No. 994 — 130 Broadway.
April 25. No. 995 — 443 East One Hundred and Twenty-second street.
††April 26. This result is the average of filtered specimens of the *two* following:
April 26. No. 996 — 6 East Forty-eighth street.
April 26. No. 997 — 28 East Ninth street.
The other results recorded were obtained on Croton water taken from the tap at the School of Mines, Columbia College.

TABLE V — (*Continued*).

EXAMINATIONS OF CROTON WATER, 1882— (Parts per 100,000).

DATE.	Chlorine.	Equivalent to sodium chloride.	Nitrogen in nitrates, etc.	Free ammonia.	Albuminoid ammonia.	Hardness before boiling.	Hardness after boiling.	Organic and volatile.	Mineral matters.	Total solids.	Oxygen Absorbed—Tidy's Test.				
											Two minutes.	Fifteen minutes.	One hour.	Three hours.	Four hours.
1882.															
June 15	......	......	0.0238	0.0020	0.0142	......	......	....	....	....	......	......	......	......	.....
June 23	......	......	0.0196	0.0020	0.0142	......	......	....	....	....	0.0795	0.1800	0.245	0.295	0.300
July 6	......	......	0.0163	0.0020	0.0163	......	......	....	....	....	0.0766	0.1750	0.247	0.302	0.289
July 14	......	......	0.0163	......	......	......	......	....	....	....	......	......	......	......	.....
Aug. 10	......	......	0.0330	......	......	......	......	....	....	....	......	......	......	......	.....
Oct. 14	......	......	......	0.0180	0.0122	......	......	....	....	....	0.1060	0.1680	0.246	0.277	0.360
Dec. 19	0.207	0.342	0.0192	0.0012	0.0092	3.042	2.000	1.30	7.50	8.80	0.0320	......	......	0.130	.....

TABLE V — (*Continued*).

Examinations of Croton Water, 1883 — (Part per 100,000).

DATE.	Chlorine.	Equivalent to sodium chloride.	Nitrogen in nitrates, etc.	Free ammonia.	Albuminoid ammonia.	Hardness before boiling.	Hardness after boiling.	Organic and volatile.	Mineral.	Total solids.	Oxygen Absorbed—Tidy's Test. Fifteen minutes.	Three hours.	Four hours.
1883.													
June 27	0.176	0.290	0.0173	0.001	0.008	2.966	2.161	1.40	7.20	8.60	0.1651	0.2129	0.2173
June 30	......	....	....	......	....	......	......	......	......	......	0.1058	....	0.1724

Examinations of Croton Water, 1884.

DATE.	Chlorine.	Equivalent to sodium chloride.	Nitrogen in nitrates, etc.	Free ammonia.	Albuminoid ammonia.	Hardness before boiling.	Hardness after boiling.	Organic and volatile.	Mineral.	Total solids.	Oxygen Absorbed—Tidy's Test. Fifteen minutes.	Three hours.	Four hours.
1884.													
Sept. 15*	0.200	0.318	0.044	0.006	0.029	4.96	3.52	4.00	5.00	9.00	....	....	....
Sept. 15 †	0.200	0.318	0.044	0.006	0.0264	4.16	3.60	3.50	5.50	9.00	....	....	....
Sept. 15 ‡	0.180	0.290	0.048	0.006	0.031	3.90	3.70	3.00	5.00	8.00	....	....	....
Sept. 19 §	0.190	0.310	0.047	0.002	0.016	3.50	3.40	3.00	5.00	8.00	....	....	....
Sept. 20 ‖	0.140	0.230	0.038	0.003	0.019	3.60	3.30	2.50	5.20	7.50	....	....	....
Dec. 9 ¶	0.333	0.530	0.065	0.001	0.009	......	......	3.50	4.90	8.40	0.1844	....	0.2764
Dec. 18 **	0.300	0.477	0.494	None.	0.016	4.99	4.47	3.50	5.20	8.70	....	....	....

* † From tanks on Church street. ‖ ¶ From School of Mines, Columbia college.
‡ From tank Greenwich and Dey streets. ** From 40 East Thirty-fifth street.
§ From Chambers street.

TABLE V — (*Continued*).

Examinations of Croton Water, 1885 — (Parts per 100,000).

DATE.	Chlorine.	Equivalent to sodium chloride.	Nitrogen in nitrates.	Free ammonia.	Albuminoid ammonia.	Hardness before boiling.	Hardness after boiling,	Organic and volatile.	Mineral matter.	Total solids.
1885.										
April 3........	0.278	0.459	0.0403	0.001	0.0090	4.730	4.310	6.00	5.00	11.00
May 6........	0.348	0.575	0.0494	None.	0.0166	4.082	3.787	1.50	4.00	5.50
May 26........	0.244	0.400	0.0340	0.002	0.0086	4.280	3.570	3.00	4.50	7.50
June 13........	0.348	0.574	0.0469	0.003	0.0070	3.860	3.500	2.50	4.50	7.00
June 30........	0.226	0.374	0.0371	0.005	0.014	4.968	4.586	2.00	5.50	7.50
July 15........	0.279	0.459	0.0390	0.002	0.0080	4.268	4.268	0.500	5.00	5.50
July 30........	0.226	0.373	0.0387	0.003	0.0110	4.332	4.332	2.50	5.00	7.50
Aug. 19........	0.278	0.459	0.0469	0.003	0.0140	4.586	3.949	3.00	5 00	8.00
Aug. 31........	0.313	0.517	0.0486	0.001	0.0090	4.331	4.331	2.00	4.50	6.50
Sept. 15........	0.209	0.344	0.0370	0.004	0.0160	5.096	4.459	2.50	4.00	6.50
Sept. 29........	0.208	0.343	0.0477	0.002	0.0094	3.949	3.822	2.50	4.00	6.50
Oct. 14........	0.272	0.458	0.0410	None.	0.013	4.520	4.294	2.50	4.00	6.50
Oct. 14*........	0.260	0.429	0.0460	0.003	0.0160	......	......	3.00	5.00	8.00
Oct. 14†........	0.272	0.458	0.0530	0.005	0.0150	......	......	2.50	5.50	8.00
Oct. 30........	0.243	0.400	0.0470	0.003	0.0150	4.512	4.512	3.00	4.50	7.50
Nov. 15........	0.312	0.515	0.0480	0.001	0.0140	3.840	3.390	3.00	4.00	7.00
Dec. 1........	0.295	0.486	......	0.0032	......	3.729	3.164	.....	.....	.....
Average....	0.272	0.448	0.0435	0.0023	0.0110	4.339	4.024	2.62	4.60	7.22
From Croton Water-shed.										
May 8‡........	0.348	0.574	0.0357	0.0026	0.0182	4.420	3.990	2.40	4.60	7.00
May 8§........	0.226	0.374	0.0486	0.001	0.0196	3.735	3.313	3.00	5.00	8.00
June 20‖........	0.261	0.431	0.0240	0.0200	0.0130	6.170	6.110	3.00	10.00	13.00
June 20¶........	0.261	0.431	0.0280	0.0160	0.0170	6.300	6.170	3.00	7.50	10.50

*From Health Department tap. †From 222 East One Hundred and Sixteenth street.
The other samples were taken from the supply at the School of Mines.
‡From dam, Intake A. §From Cross river, Katonah.
‖From Titicus river, No. 1. ¶From Titicus river, No. 2.

Examinations of Croton Water, 1886.

DATE.	Chlorine.	Equivalent to sodium chloride.	Nitrogen in nitrates.	Free ammonia.	Albuminoid ammonia.	Hardness before boiling.	Hardness after boiling.	Organic and volatile.	Mineral matter.	Total solids (evaporation).
1886.										
Jan. 5........	0.243	0.401	0.037	None.	0.0068	3.446	3.277	1.70	4.80	6.50
Jan. 15........	0.347	0.572	0.048	0.002	0.007	3.840	3.730	3.00	3.50	6.50
Jan. 30........	0.312	0.515	0.047	0.003	0.009	2.940	2.590	....	....	....
Feb. 16........	0.381	0.629	0.053	0.001	0.006	2.940	2.370	2.20	4.80	7.00
Mar. 3........	0.243	0.401	0.047	0.003	0.003	2.548	2.038	1.50	3.50	5.00
Mar. 19........	0.243	0.401	0.045	0.005	0.005	2.548	2.548	....	....	....
April 7........	0.312	0.515	0.055	0.003	0.009	3.300	3.300	3.50	4.00	7.50
April 17........	0.295	0.487	0.047	0.003	0.010	3.540	3.540	2.00	4.80	6.80
May 4........	0.312	0.515	0.049	0.003	0.009	2.850	2.710	1.04	5.28	6.32
May 18........	0.170	0.274	0.039	0.003	0.006	3.073	2.836	2.00	5.50	7.50
May 30*........	0.243	0.401	0.049	0.001	0.005	3.720	3.720	2.50	4.50	7.00
June 16........	0.348	0.575	0.049	0.002	0.005	3.545	3.545	5.40	4.10	9.50
June 30........	0.247	0.408	0.048	0.001	0.0073	4.067	4.067	2.00	8.00	10.00
June 30†........	0.330	0.543	0.048	0.001	0.004	4.183	4.067	4.00	5.00	9.00
Average......	0.288	0.474	0.0472	0.0022	0.0066	3.324	3.167	2.595	4.815	7.41

*From Eighth avenue and Twenty-sixth street. †From 11 East Thirty-sixth street.
The other samples were from the supply at School of Mines, Columbia college.

TABLE V — (*Continued*).

Examinations of Croton Water, 1887 — (Parts per 100,000).

DATE.	Chlorine.	Equivalent to sodium chloride.	Nitrogen in nitrates.	Free ammonia.	Albuminoid ammonia.	Hardness before boiling.	Hardness after boiling.	Organic and volatile.	Mineral matter.	Total solids.
1887.										
Aug. 24*...	0.239	0.395	0.048	0.002	0.004	4.50	4.35	3.50	6.00	9.50
Aug. 25†...	0.220	0.350	0.049	None.	0.007	4.50	4.40	4.00	5.00	9.00
Sept. 2‡...	0.205	0.339	0.040	0.001	0.011	4.10	4.00	2.50	4.50	7.00
Sept. 2§...	0.220	0.350	0.046	0.003	0.012	4.00	4.00	1.70	4.80	6.50
Dec. 3†...	0.197	0.325	......	......	......	......	......	4.00	5.00	9.00

Examinations of Croton Water, 1888.

DATE.	Chlorine.	Equivalent to sodium chloride.	Nitrogen in nitrates, etc.	Free ammonia.	Albuminoid ammonia.	Hardness before boiling.	Hardness after boiling.	Organic and volatile.	Mineral matter.	Total solids (evaporation).
1888.										
Jan. 11....	0.233	0.384	0.0247	0.0020	0.0040	3.67	3.67	2.20	3.80	6.00
Jan. 18....	0.256	0.422	0.0642	0.0020	0.0050	2.75	2.75	1.50	4.40	5.90
Jan. 25....	0.229	0.378	0.056	0.0020	0.005	3.75	3.67	1.30	4.40	5.70
Feb. 1....	0.231	0.380	0.050	0.0030	0.004	3.59	3.59	1.90	5.60	7.50
Feb. 8....	0.236	0.389	0.065	0.001	0.002	3.13	3.13	1.20	4.95	6.15
Feb. 15....	0.219	0.361	0.082	0.001	0.005	3.17	2.84	1.60	4.60	6.20
Feb. 22....	0.211	0.347	0.032	0.001	0.010	2.75	2.75	1.40	4.50	5.90
Feb. 29....	0.183	0.301	0.063	0.003	0.007	2.29	2.29	1.65	3.30	4.95
Mar. 7....	0.188	0.310	0.0824	Trace.	0.010	2.29	2.09	1.75	3.50	5.25
Mar. 14....	0.193	0.318	0.0658	Trace.	0.0107	2.73	2.73	1.70	4.10	5.80
Mar. 21....	0.204	0.335	0.0824	Trace.	0.0130	3.66	3.34	1.10	5.00	6.10
Mar. 28....	0.190	0.313	0.0880	0.0010	0.0124	2.91	2.91	1.40	3.50	4.90
April 4....	0.169	0.279	0.0800	None.	0.0169	2.75	2.42	2.00	4.10	6.10
April 11....	0.187	0.307	0.0582	0.0018	0.0197	2.78	2.55	1.70	4.20	5.90
April 18....	0.192	0.316	0.0453	Trace.	0.0082	2.94	2.45	1.80	3.50	5.30
April 25....	0.213	0.352	0.0733	0.0010	0.0050	3.074	2.671	1.40	4.00	5.40
May 2....	0.231	0.380	0.0576	Trace.	0.0034	3.40	3.01	3.00	4.50	7.50
May 9....	0.229	0.377	0.0650	Trace.	0.0060	3 34	3.14	1.90	4.70	6.60
May 16....	0.197	0.324	0.0461	Trace.	0.0125	3.73	3.40	1.20	4.90	6.10
May 23....	0.195	0.321	0.0486	0.0010	0.0094	3.96	3.83	1.90	4.40	6.30
May 30....	0.188	0.310	0.0247	0.007	0.0170	4.06	3.40	2.10	6.00	8.10
June 6....	0.212	0.349	0.0700	Trace.	0.030	3.86	3.47	2.30	6.50	8.80
June 13....	0.153	0.253	0.0387	0.0030	0.0070	4.054	3.401	2.20	4.00	6.20
June 20....	0.170	0.281	0.0400	Trace.	0.0040	6.30	5.60	1.50	5.80	7.30
June 27....	0.188	0.310	0.0243	0.0005	0.0055	4.38	4.12	1.40	5.40	6.80
July 4....	0.176	0.290	0.0329	Trace.	0.0055	4.38	4.12	1.50	5.30	6.80
July 11....	0.214	0.352	0.0329	Trace.	0.0070	4.45	4.12	1.80	5.90	7.70
July 18....	0.197	0.324	0.0411	Trace.	0.0055	5.23	4.71	2.50	4.50	7.00
July 25....	0.221	0.363	0.0500	Trace.	0.0065	4.71	4.19	1.80	6.10	7.90
Aug. 1....	0.197	0.324	0.0412	Trace.	0.0065	4.77	4.38	2.00	5.50	7.50
Aug. 8....	0.205	0.338	0.0329	Trace.	0.0065	4.25	3.79	2.30	5.70	8.00
Aug. 15....	0.198	0.327	0.0284	0.0005	0.0095	4.19	3.99	1.50	5.80	7.30
Aug. 22....	0.214	0.352	0.0321	0.0010	0.0115	4.45	4.38	1.70	5.30	7.00
Aug. 29....	0.183	0.301	0.0284	0.0005	0.0090	3.92	3.92	1.70	4.90	6.60
Sept. 5....	0.188	0.310	0.0404	0.0010	0.0090	3.92	3.85	2.20	4.80	7.00
Sept. 12....	0.197	0.324	0.0453	Trace.	0.0110	3.60	3.60	2.20	5.50	7.70
Sept. 19....	0.197	0.324	0.0247	Trace.	0.0060	3.92	3.92	2.30	5.00	7.30

* From Health Department, 301 Mott street.

† From School of Mines, Columbia College.

‡ From 128 Worth street.

§ From 345 West Forty-seventh street, Twenty-second precinct police station.

TABLE V — (*Continued*).

EXAMINATIONS OF CROTON WATER, 1888 — (Parts per 100,000).

DATE.	Chlorine.	Equivalent to sodium chloride.	Nitrogen in nitrates.	Free ammonia.	Albuminoid ammonia.	Hardness before boiling.	Hardness after boiling.	Organic and volatile.	Mineral matter.	Total solids.
1888.										
Sept. 26....	0.197	0.324	0.0321	0.0010	0.0125	3.92	3.85	2.30	4.70	7.00
Oct. 3....	0.197	0.324	0.0247	Trace.	0.0060	3.92	3.92	2.30	4.80	7.10
Oct. 10....	0.115	0.189	0.0192	Trace.	0.0040	2.099	2.099	1.458	3.090	4.548
Oct. 17....	0.205	0.338	0.0329	Trace.	0.0080	3.740	3.220	2.30	5.50	7.80
Oct. 24....	0.205	0.338	0.0247	Trace.	0.0060	4.06	3.74	2.10	5.40	7.50
Oct. 31....	0.205	0.338	0.0453	Trace.	0.0050	4.13	3.87	2.30	6.10	8.40
Nov. 7....	0.205	0.338	0.0412	Trace.	0.0060	3.93	3.81	2.50	5.70	8.20
Nov. 14....	0.205	0.338	0.0412	Trace.	0.0060	4.38	4.32	2.50	5.50	8.00
Nov. 21....	0.214	0.352	0.0329	Trace.	0.0065	3.93	3.68	2.50	5.20	7.70
Nov. 28....	0.222	0.366	0.0329	Trace.	0.0061	4.00	3.93	2.40	5.60	8.00
Dec. 5....	0.214	0.352	0.0371	Trace.	0.0035	3.87	3.68	2.40	5.10	7.50
Dec. 12....	0.222	0.366	0.0412	Trace.	0.0040	4.13	3.23	2.20	5.10	7.30
Dec. 19....	0.214	0.352	0.0370	Trace.	0.0045	3.48	3.23	2.40	5.30	7.70
Dec. 26....	0.188	0.310	0.0576	Trace.	0.0020	3.22	3.22	1.10	5.00	6.10
Average..	0.202	0.332	0.0452	0.0005	0.0078	3.696	3.412	1.909	4.903	6.812

During the first half of the year 1888 the samples were taken from the supply at the School of Mines. During the last half they were taken from a hydrant on Fifth avenue, which was blown off for three to five minutes before taking the sample.

IV. METHODS OF DISPOSAL OF ORGANIC WASTES.

Numerous methods of disposing of the pollution from organic sources, which are more or less complete in their action, have been suggested. They may be arranged in a general classification, such as the following, which will be carried more into detail in the discussion of the separate items:

A. Natural organic pollution, such as that from swamps and peat bogs, vegetation on the surface of the ground, and vegetation in streams and reservoirs. These may be removed in part as follows: By *(a)* isolation and drainage, and *(b)* flooding of the swamps and bogs; by *(c)* clearing off the surface vegetation; by *(d)* raking out and destroying or removing aquatic vegetation, *(e)* by killing it by change of water level and then removing, or *(f)* by preventing its growth by increasing the depth of the water and the slopes of the banks by excavation or otherwise.

B. Artificial organic pollution from factories, villages, farm-houses and their adjuncts, manured fields, roads and streets. These may all be abated at once by *(a)* removing all inhabitants from the territory. All pollution except that from manured fields can be more or less completely removed by *(b)* outlet sewers emptying below the dam, with branches, pumping stations, etc. The pollution from all factory wastes not collected by such sewers can be removed by *(c)* purification of the liquids before entrance into water-courses, and destruction or removal to safe distances from the water-courses of solid refuse. Village wastes can be removed either by *(d)* a water-carriage system, the liquid portions to be purified before entrance into the water-courses, and the solids to be destroyed or removed to safe distances from the water-courses, or by *(e)* a system of dry removal, the contents of receptacles being destroyed or removed to safe distances. The organic wastes from isolated dwellings or farm-houses and their adjuncts can be removed by methods similar to those described in *(d)* and *(e)*, or their deleterious effect upon the water can be reduced to insensible amounts by *(f)* removal of the sources of pollution to proper distances from water-courses. The danger resulting from manured fields can be palliated by *(g)* restrictions regarding kind, amount, and manner of application of fertilizers, and regarding locations of pastures. The pollution from road and street washings can be largely diminished by *(h)* collection and destruction of street dirt, by *(i)* collection, partial or total, of surface drainage from villages and its purification before discharge into streams, and by *(j)* irrigation of sufficient areas of land by the road drainage waters, in case of the less frequented highways.

Let us now consider each of these various methods in the order above given.

Aa. Swamps and Bogs. It will not be difficult in many cases to drain or improve mill ponds, swamps, peat-bogs, and the like, by a system of drainage similar to that carried out at Kirby's pond, concerning which see the descriptions of photographs N 1a to N 1d, Plates XXII and XXIII. This will greatly benefit the water flowing through such places, which is now often much discolored by vegetable matter. Where the foregoing procedure is not expedient, an improvement of the water can be secured by the isolation of the swamp or bog, on either hillside or flat land, by means of suitable catch-water channels located near the margins of such swamps. The clean surface drainage from the high districts may thus be kept entirely out of the marshy areas and delivered into the main stream at some convenient point below, while the swamp itself will undergo corresponding improvement by the relief so afforded. Springs of pure water in the marsh may likewise be traced out and their waters collected into a single channel, so that ultimately the swamp will receive little more than the rainfall upon its own area, the greater portion of which will disappear by evaporation.

Ab. In some cases these swampy or peaty places are in the bottoms of proposed reservoirs. When these reservoirs are built, the depth of water will prevent the further growth of vegetation and formation of peat, and the water will flow over rather than through the matter, thus eventually eliminating the pollution of the water from such cause.

Ac. Surface Vegetation. Where growth and decay of vegetation on the surface of the ground is a source of pollution to the water, it can be best removed by clearing and removing the obnoxious vegetation, and replacing it, if possible, by a more favorable growth, changing the conditions sufficiently to render the improvement permanent.

Ad, e, f. Aquatic vegetation. The subject of the growth and decay of vegetation in reservoirs has already been partially discussed in section E of the second division of this report and

in the descriptions of the Croton Lake photographs, to which reference is now made. That discussion was confined to the coarser varieties of aquatic vegetation. On the subject of dealing with the minute algæ which flourish at times in reservoirs, but little of practical value can as yet be said owing to the lack of the necessary experimental data ; but it may be mentioned in general that great benefit has resulted from removing muddy deposits on the bottoms and margins of streams and ponds, and securing at all times a considerable depth of water over such places, together with the utmost practicable exclusion of all forms of organic matter from the water. The testimony of water-works officials throughout the country indicates that, in spite of every precaution, such plants will develop in all waters, and occasionally to such extent as to cause a disagreeable taste and odor therein. No general remedy for these conditions has yet been found, and each case must therefore be studied as it arises with the view of ascertaining the proper means of avoiding its recurrence. In some cases these algæ collect on the surface in the form of a scum, which may be floated off by means of suitably arranged overflows or waste pipes ; in other cases they are found in largest quantity where the coarser plants are most abundant, so that a removal of the latter will be followed immediately by an improvement of the water. Fortunately, however, such trouble is usually of short duration and is rarely ever attended with any appreciable deterioration of the public health. Mention of the necessity of thoroughly purifying the sites of buildings to be covered by the water in the new reservoirs was omitted in the discussion of them. Its importance is such that this should be sufficient to demand for it all the attention it deserves.

Ba. Depopulation. The most complete method of removing artificial organic pollution from the Croton water would evidently be the complete depopulation of the water-shed. As this would involve the purchase of about 361 square miles of valuable land

and the removal of nearly 25,000 people, the plan is evidently out of the question, and we must be content with the nearest possible approach to this ideal condition.

Bb. General Sewerage. It has been suggested that a system of sewerage would give a good approximation to the ideal condition. A consideration of the scattered population in the country districts, and of the fact that there are not far from 1,000 miles of roads on the water-shed, will show that an application of such a system to the entire area would be all but impossible, owing to its enormous cost, and when the amount of water which would be necessary to operate such a system successfully is computed, the plan will be immediately removed from the necessity of consideration.

Should the system of sewers be restricted to the villages, and to such houses as could reach the outlets from the villages, there would be required from 40 to 100 miles of outlet sewers to accomplish any material result, to which must be added the sewerage system of each separate village, and a pumping plant for such of them as would be below the grade of the main outlet. The villages along the reservoir would all be below a uniform grade line drawn from the top of the Quaker Bridge dam to the village of Brewster. As the lowest point in that village is not more than 370 feet above the Croton datum, and flood level of the Quaker Bridge dam is 206 feet above the same datum, the fall in such a sewer would be 164 feet in the distance of twenty miles, or 8.2 feet per mile. The size of sewer, from which all rain-fall is excluded, necessary to give a self-cleansing velocity at this grade, would serve a population somewhat greater than that on the entire water-shed. The portion of the water-shed above Brewster could not be served by this sewer unless laid at a still flatter grade. The grades necessary to reach the various villages can easily be obtained from the elevations given on Plate I and distances measured thereon. A computation of the amount of water necessary for the transportation

of the waste matter with proper velocity through the system, will show quite a large per cent of the available water supply. In the case of the sewer to Brewster, above mentioned, the grade may be taken at one in 643. To secure a self-cleansing velocity of 2.5 feet per second, the sewer must be twenty inches in diameter and run at least one-half full, then discharging about 1,750,000 gallons per day. Assuming a water supply of fifty gallons per head per day, this discharge would correspond to a population of about 35,000. For a smaller population recourse must be had to the storage of sewage and its intermittent discharge, the size of the conduit remaining the same. Should the sewer be laid in tunnel, a better grade could be obtained and the volume of flushing water lessened, but as an offset we would have the enormous cost of the tunnel, necessarily several times the size of the pipe needed to carry the sewage, to give room for the work of driving it. It should be remembered also that the number of houses in all the villages is but 2,136 out of the 5,056 houses on the entire water-shed; hence, by limiting the sewer work to the villages alone, the remaining 2,900 houses on the water-shed, of which 1,800 deserve special attention, will remain uncared for. Furthermore, there are in the villages 1,406 of the 5,612 outbuildings on the the entire water-shed, and therefore the remaining 4,200 outbuildings, of which 2,500 have been noted as requiring special attention, would thus remain uncared for. These numbers may be slightly reduced by subtracting the number of houses which could reach the outlet sewers of the villages. Such reduction will depend much on the routes chosen for the sewers. It is, however, not probable that all the places named in the list of villages and hamlets at the end of Table IV would be given branch sewers, so that the number to be added may very nearly offset the number to be deducted as being in the villages not served. An additional expense would be that of purifying the sewage before permitting it to enter the stream below, to prevent

nuisance at or near the point of discharge. It will also be necessary to apply other methods for the localities not served, should this system be constructed.

Bc. Factory Wastes. The liquid refuse from factories, not disposed of through sewers, can be purified by proper filtration through earth, sand or other suitable materials before being discharged into the water-courses or the ground water. Solid putrescible refuse should be removed to such distance from water-courses that the drainage or leachings from it shall not enter the streams without undergoing sufficient purification by percolating through the soil. Large deposits of such matter should not be made in one place. The safest plan would be to remove it entirely from the water-shed.

Bd. Independent Sewerage for Villages. There are four principal sources of organic pollution from villages, (1) the human excrement; (2) animal excrement; (3) garbage; (4) street and area sweepings and dirt. The first, second and possibly the fourth, can be removed by a system of water carriage. The second would probably not be so removed from choice, owing to the desire to use it as a fertilizer, and the third could not be so removed.

Should all three or the first and fourth be removed by water carriage, a "combined" system of sewers would be required, admitting to the sewers surface drainage as well as house sewage. This sewage could not be permitted to enter the water-courses without purification. To take care of the water flowing from the sewers in times of heavy rain, sewage treatment works of comparatively large size, or large storage tanks would be necessary, and the sewage would be at times very dilute. Should storm-water overflows be provided, a certain amount of sewage, small in proportion to the amount of water flowing, but still almost the whole amount from the village during the time of action of the overflow, would flow into the streams. This would not be permissible in the present case.

Should a "separate" system of sewerage be decided upon for a village, sewage-disposal works upon a much smaller scale would be necessary. The treatment of street drainage would then be a problem by itself, and it might be possible in such case to secure the earlier washings of the streets during storms for purification, and allow the later, less defiled portions to escape into the water-courses. Where the roadways are paved or improved, this part of the problem might be rendered easier to solve by removing the street dirt by dry removal with the garbage, leaving but a small proportion of it to be treated in the drainage water.

Of the systems of sewage disposal there are many varieties, which may be gathered into three general classes — the chemical treatment to produce a clarified effluent; filtration, constant or intermittent, through natural or artificial filters, and irrigation on or under the surface.

It is believed that no chemical treatment yet devised will give an effluent sufficiently purified to be at all times absolutely safe for admixture with drinking water. It will, therefore, in general, be necessary to use some one of the other methods of purification mentioned as an adjunct to the chemical treatment. The sludge precipitated from the sewage in the chemical treatment must necessarily be completely deodorized to prevent nuisance, and should then be removed. Its use upon land in the immediate vicinity of water-courses, or in large quantities simply upon the surface of the land without being incorporated therewith, should be prohibited. Since its value as a fertilizer is very small, it will be well to destroy it entirely. This may be done by drying it or mixing it with some combustible material to increase its consistency, when it may be carried to the garbage destructor suggested in the following article on dry removal systems, and there consumed.

Filtration of sewage through natural or artificial media properly requires a previous sedimentation and straining out

of the solids, together with their deodorization, in order to prevent nuisance arising from the filter beds. This can be best attained by some chemical process and its adjuncts. There are many systems of filtration, from the most elaborate artificial filter to a simple bed formed of natural soil. Most of the methods require intermittent action, at least to the extent of changing filters for purposes of cleaning. For the efficient filtration of the liquid through the earth, intermittence of action is absolutely indispensable. For any system chosen, the requirements are freedom from obnoxious odors and purity of effluent.

Irrigation, whether broad, or subsurface, also requires the removal of solids from the sewage to prevent nuisance, or to prevent clogging of the subsurface pipes. Greater areas of land will be necessary for the application of the system of broad irrigation than of that of filtration, owing to the necessity of caring for the growing crops. The system of subsurface irrigation seems to work fairly well, with proper attention, for small amounts of sewage. Larger amounts should probably be divided and run into several small plots rather than into one large one. Systems of intermittent filtration through land and of broad irrigation will require special attention in the winter season. Thorough chemical treatment to give as pure an effluent as possible will then be necessary to prevent nuisance. It is believed that in most cases, and in the weather of most winters there will be but little if any trouble found in running the clarified effluent over the land as usual, if great pains are taken during the cold season to procure as pure an effluent from the precipitation works as possible. However, there is always a risk of nuisance arising from defects, more or less temporary, in the working of the system during the cold season.

Should the street drainage be collected as a whole, or only its more polluted portions, it could be run through similar processes to those above described. Should no system of street cleaning and dry removal of the refuse be adopted, some method

of purification would generally be necessary. It would be best to adopt one in any case.

Be. Dry Removal. Of the four principal sources of organic pollution from villages, mentioned above, the garbage must be treated by a system of dry removal, and all four may be. The systems of dry removal may be classed as (1) the pail system, including in this term all methods of removal by the use of portable receptacles, and (2) the pneumatic systems. The requirements in any case are freedom from nuisance, both in use and in removal, thoroughness and completeness. It is probable that some pail system will be found to be the cheapest and in many respects the most satisfactory in nearly all cases. It is hard to see how any other method can be applied in some instances. A thorough system, carefully conducted with the above requirements in mind, is what is necessary. Such systems of various forms are in existence of all grades of performance of the duty desired of them.

The disposal of the collections of human and animal excrement, garbage, and street dirt, as well as of the sludge from the chemical treatment of sewage, is a serious problem, for which the following solution is offered. Nearly all the villages on the water-shed — all that should have a system of removal of wastes extended over their whole area — are situated on the railroads, of which there are three, the Harlem division of the New York Central and Hudson River railroad, with Mt. Kisco, Bedford station, Katonah, Golden's Bridge, Purdys, Croton Falls, Brewster, Dykeman, Towners, Patterson and Pawling on its main line, and Somers Center and Lake Mahopac on its Mahopac branch, and Somers but a short distance away; the New York and Northern railroad, with Mertens, Kitchawan, Croton Lake, Yorktown, Amawalk, West Somers, Baldwin Place, Lake Mahopac, Crafts, Carmel, Tilly Foster and Brewster on its main line, and Mahopac Falls and Mahopac Mines on its Mahopac Mines branch;

and the New York and New England railroad, with Reynoldsville, Towners, Dykeman, Brewster and Southeast Center on its main line. These lines all converge in the northern part of the village of Brewster. It would be easy to locate a crematory or garbage destructor near this point, and to transport the solid refuse, and the semi-solid refuse after admixture with suitable other matter to give it proper consistency, by means of cars from the various villages to such destructor. One central furnace can thus be made to do the work for practically all of the villages, and an economical solution of the problem is thereby offered. The amount of material to be thus disposed of can be approximately estimated by a consideration of the various villages, and it will be found that the expense of transportation and combustion will be a comparatively small proportion of the cost. In some places it would be quite difficult to dispose of the solid refuse in any way except by burning without danger of nuisance or of pollution of the the water, and in all cases it would be necessary to exercise extreme care to obviate these dangers.

Should the animal excrement in villages not be removed at frequent intervals by any of the methods suggested, but be preserved for use as a fertilizer, strict supervision should be exercised over its manner of keeping to see that none of it, nor any drainage from it, reaches the water-courses unpurified.

Bf. Farm Buildings. The wastes from farm houses are similar in character to those from villages. Probably the most important is the human excrement, which frequently finds its way directly into the water-courses, from the fact that privies are very often set near the water-courses for the purpose of having their deposits carried away. Next in order is the animal excrement, which on a large dairy farm during the winter time accumulates to many tons. Any of the methods of sewage disposal can be applied to farm houses. That of subsurface irrigation has been so applied in a number of instances in other

localities. A pail system or dry earth removal can also be applied to human excrement. On the other hand privy pits, cesspools or outlets from water-closets can be removed to a distance from water-courses sufficient to insure purification of the liquids by filtration through the soil before the water level is reached. Animal excrement must be stored in such manner or at such distance from water-courses, that no polluted drainage therefrom can reach the water. The drainage from yards, pig-pens, chicken-houses, barn-yards, and farm buildings and grounds generally, must have efficient purification before entering the streams, and this can be best secured by compelling the polluted drainage waters to flow over or through the land for considerable distances, depending upon the steepness of slope, character of ground, whether pervious, as sand, gravel or loam, or impervious, as rock, clay, or compacted earth, and upon the degree of concentration of the flow in channels. Any building, storage place for accumulations of organic matter, or yard such as above enumerated, if located within what may be called the safe-line, should be so arranged that its drainage shall not enter the stream, without undergoing some purifying process. Cess-pools and privy-pits should be subjected to similar restrictions, but the safe distances in these cases would be greater than in the other cases mentioned.

Bg. Manured Fields. Evidently human excrement, as the contents of "pails" or boxes from privies, the solids precipitated from sewage, or any other form, should not be deposited near water-courses, nor should they be deposited in piles, but they should be removed beyond the safe-line, scattered, and thoroughly mingled with the earth, to secure their speedy disintegration as organic compounds. The use of other fertilizers near streams, and especially reservoirs, should be restricted so as to prevent their deposit in large quantities, or their reaching the water before they have had time to become incorporated with the soil, so far as this is possible.

Bh, i. Street Refuse and Washings. These items have already been discussed in connection with the treatment of villages. A removal of the street droppings and refuse by a system of street cleaning seems quite necessary to the purity of the surface drainage from villages, especially in the case of villages near the reservoirs.

Bj. Road drainage. The cleaning of country roads is less important than that of the village streets only because the travel on them is less. A method of making them self-cleansing to some extent is suggested in section E of the second division of this report. This would seem especially appropriate to apply near the shores of reservoirs.

Respectfully submitted.

CHAS. C. BROWN, C. E.

ALBANY, N. Y., *January* 26, 1889.

DR. LEWIS BALCH,

Secretary of State Board of Health:

DEAR SIR.— I have carefully examined the elaborate and exhaustive Report of the Sanitary Inspection of the Croton Water-shed, by Professor Charles C. Brown, C. E., and fully concur in the opinions and suggestions made by him for the improvement of the various localities therein mentioned, with the view of promoting the purity of the water supply for the city of New York.

Respectfully.

EMIL KUICHLING,

Consulting Engineer.

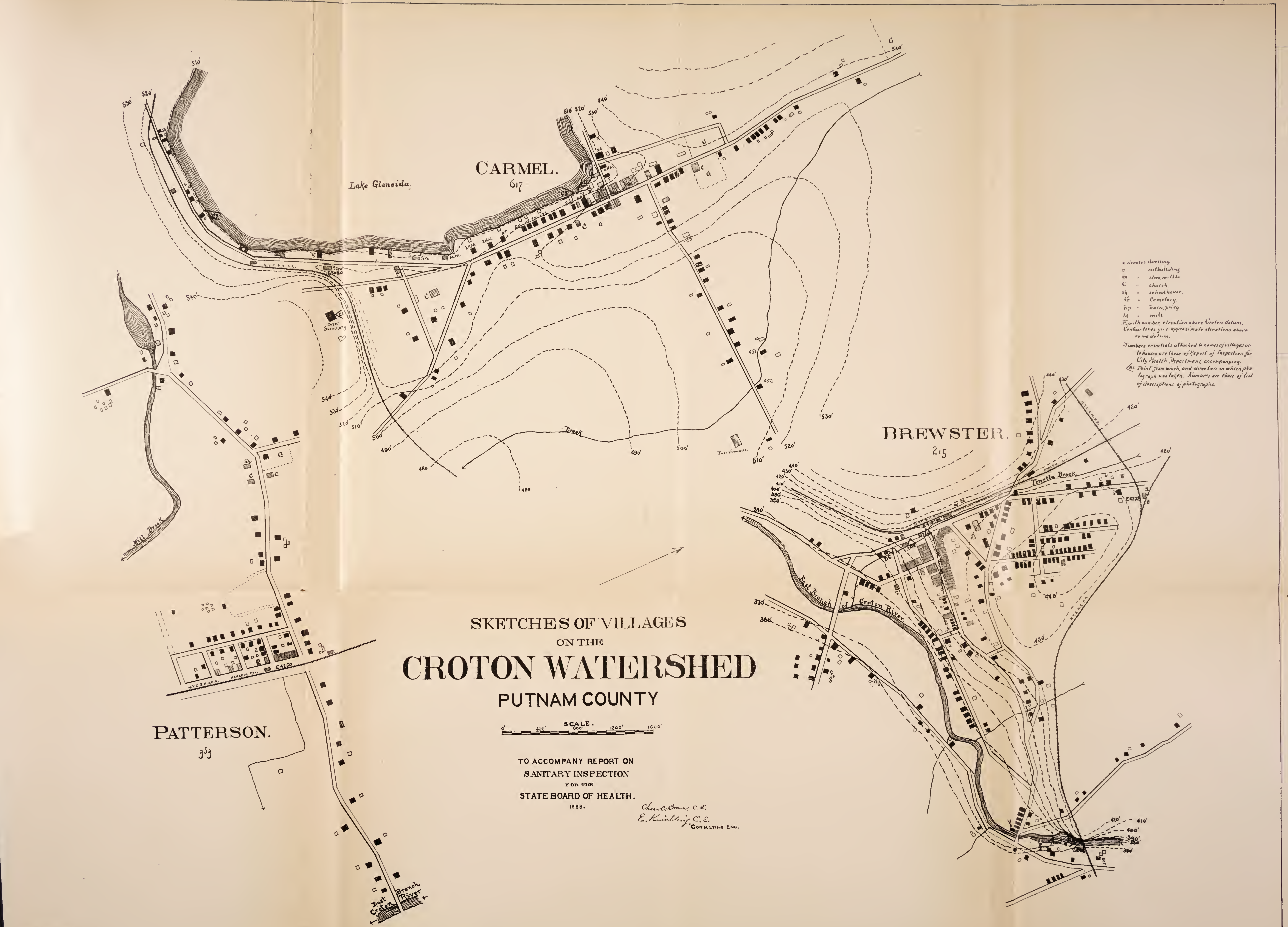
PLATES.

CHAS HART & SONS, LITH. 36 VESEY ST. N.Y.

CHAS. HART & SONS LITH. 36 VESEY ST. N.Y.


SOMERS.
Brook
CROTON FALLS.
179
West Branch
East Branch
Croton River
CF1
CF2
CF3
215'
225'
235'
245'
255'
SALEM CENTER.
110
Titicus River
GOLDEN'S BRIDGE.
63
Croton River
Brook
HARLEM DIV.
PURDYS.
79
Croton River
Titicus River
200'
210'
220
SKETCHES OF VILLAGES
ON THE
CROTON WATERSHED
WESTCHESTER COUNTY
B
SCALE.
0' 400' 800' 1200' 1600'
TO ACCOMPANY REPORT ON
SANITARY INSPECTION
FOR THE
STATE BOARD OF HEALTH.
1888.
Chas. C. Brown, C. E.
E. Kuichling, C. E.
Consulting Eng.
Brook
SOUTH SALEM.
Titicus River
NORTH SALEM.
116
denotes dwelling
outbuilding.
store, mill &c.
C - church
Sh - school house.
G - Cemetery.
b, p - barn, privy.
M - mill
E, with number, elevation above Croton datum.
Contour lines give approximate elevations above same datum.
Numbers or initials attached to names of villages or to houses are those of Report of Inspection for City Health Department, accompanying.
Point from which and direction in which photograph was taken. Numbers are those of list of descriptions of photographs.
CHAS. HART & SONS. LITH. 36 VESEY ST. N. Y.

PLATE IV.



CHAS. HART & SONS. LITH. 36 VESEY ST. N.Y.

KITCHAWAN.—Stables draining directly into brook, one-half mile from Croton Lake.

PLATE VI.

CROTON LAKE, 1.—Arm of Croton Lake with low bank, shallow margin. Houses near bank, especially in background near head of arm.

CROTON LAKE, 3.—Portion of Village of Pine's Bridge, on south shore of lake. Outlet of brook, and drain of houses and barns at extreme right.

CROTON LAKE, 7.—7, 8 and 9 are views of arm of new reservoir, taken from bluff projecting into it, showing slopes and character of bottom. 7 is a continuation of 8 to the left.

CROTON LAKE, 8.—Continuation of 7 to the right and of 9 to the left. Muscoot hill on the right.

CROTON LAKE, 9.—Continuation of 8 to the right. Present lake shows in the center.

CROTON LAKE, 10.—Showing character of slopes in arm of new reservoir, looking up valley of first brook on north side below Muscoot Hill.

CROTON LAKE, 11.—11 to 16 are views taken from northerly slopes of Muscoot Hill, to show character of ground and slopes in vicinity of proposed Muscoot Dam. 11 to 14 are taken from a point 200 or 300 feet west of 15 and 16. 11 looks up the valley of Muscoot River.

CROTON LAKE, 12.—Continuation of 11 to the right. Muscoot River runs behind low hill with white house just left of center, and thence to right at foot of hill, to the building on the extreme right.

CROTON LAKE, 13.—Continuation of 12 to the right. Nelson's race track on the right. Muscoot River runs along row of trees in middle ground.

CROTON LAKE, 15.—Taken from slightly different point of view from 11 to 14. Nelson's race track at the left. Croton River runs from right to left across center, receives Muscoot River at extreme left, and flows back to right at foot of slope in foreground.

CROTON LAKE, 16.—Continuation of 15 to right. The proposed Muscoot dam site at Woodsbridge is near the houses in the background on the left. The other proposed site is to the right of the right side of the picture.

CROTON LAKE, 21.—21 to 24 are taken from hill north of Purdys. In 21 the cornfield will be a shallow part of new reservoir, or subject to fluctuations of level between flow line and flood line. Part of Purdys is in the middleground. Titicus River runs in front of buildings. Large building on right is condensed milk factory on bank of river.

CROTON LAKE, 22.—Continuation of 21 to right. Purdys in middleground. Railroad bridge over Titicus River in center. Wagon bridge over Croton River on right. Center of bridge at flood level of new reservoir.

CROTON LAKE, 23.—Continuation of 22 to right from slightly different point of view. Croton River bridge of 22 is seen on left of center. Titicus River at its junction with Croton River in the center.

CROTON LAKE, 24.—Continuation of 23 to right from slightly different point of view. Croton River runs from right to left across center of picture.

PLATE XXI.

CROTON LAKE, 25.—Looking south, down Croton River, from village of Croton Falls. Upper end of proposed new reservoir.

PLATE XXII.

N 1b.—Kirby's Pond (Kisco Lake). Village on bank. House and outbuildings on water's edge.

PLATE XXIII.

N 1d.—Kirby's Pond (Kisco Lake) in process of drainage.

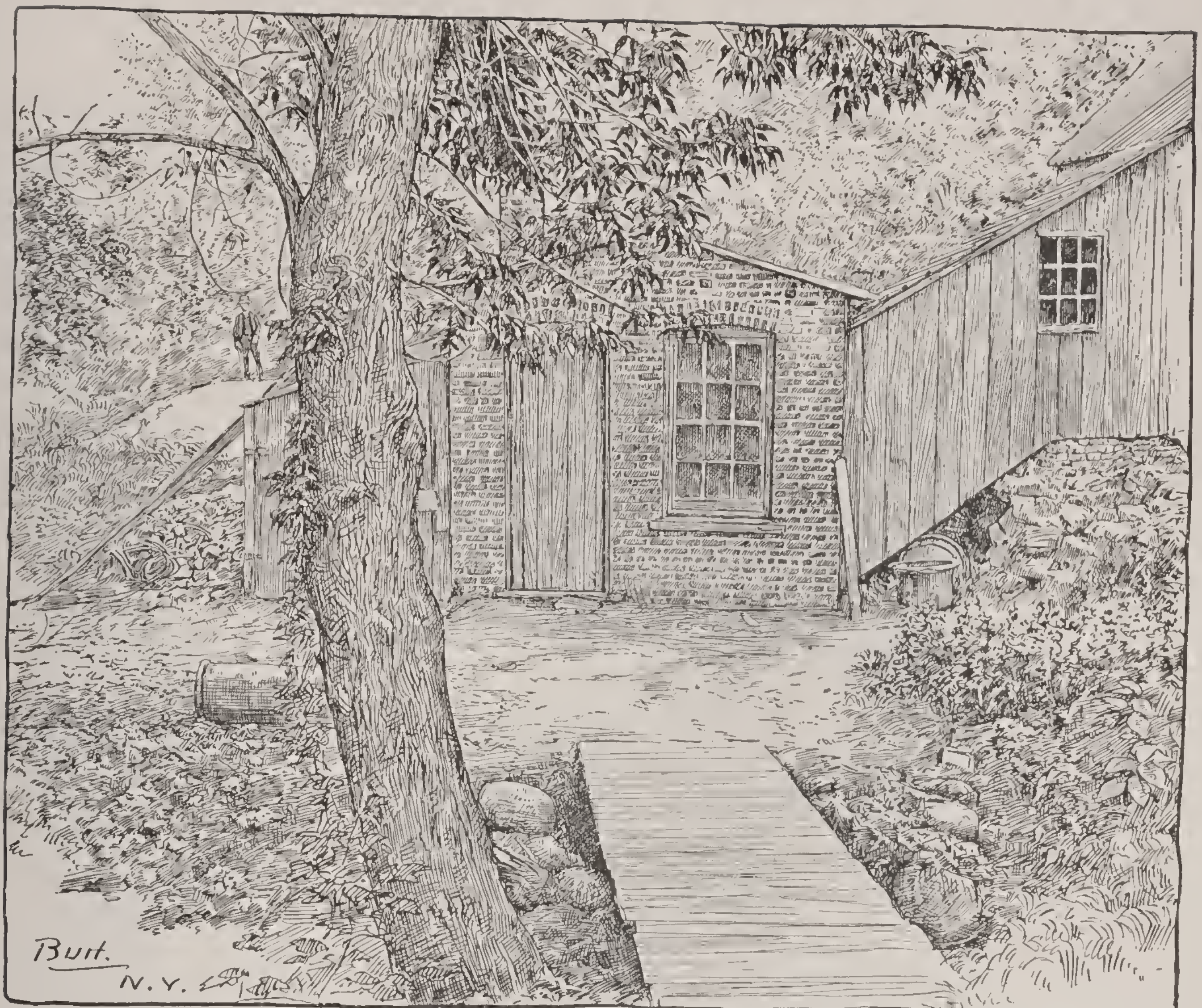
PLATE XXIV.

N 2.—Outbuildings on banks of and over outlet to Kirby's Pond (Kisco River) in village of Mt. Kisco.

PLATE XXV.

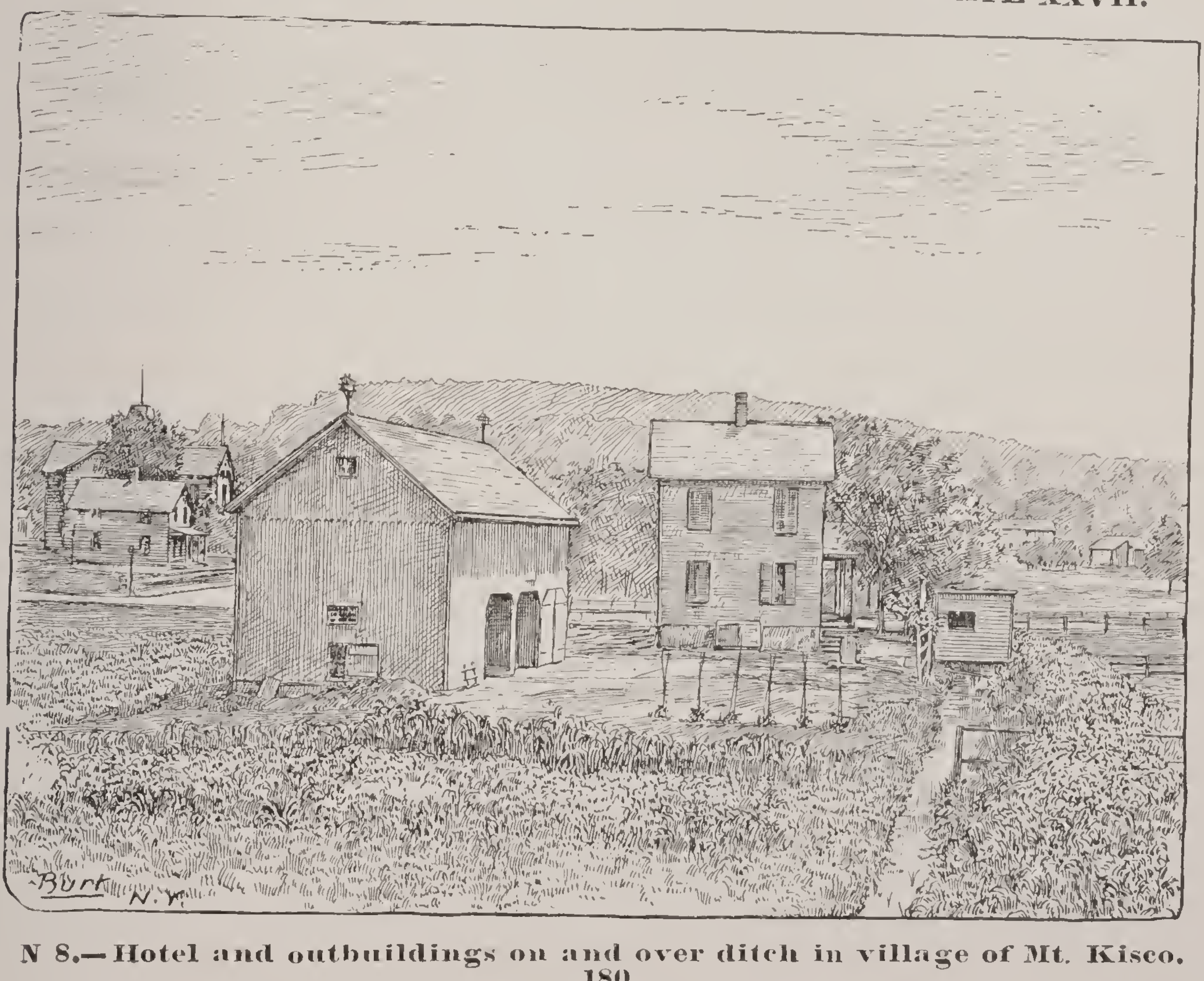
N 3.—Tail-race and mill buildings at pond just below Kirby's Pond on Kisco River.

PLATE XXVI.



N 4.—Mill buildings and refuse dump. Same place at N 3.

PLATE XXVII.



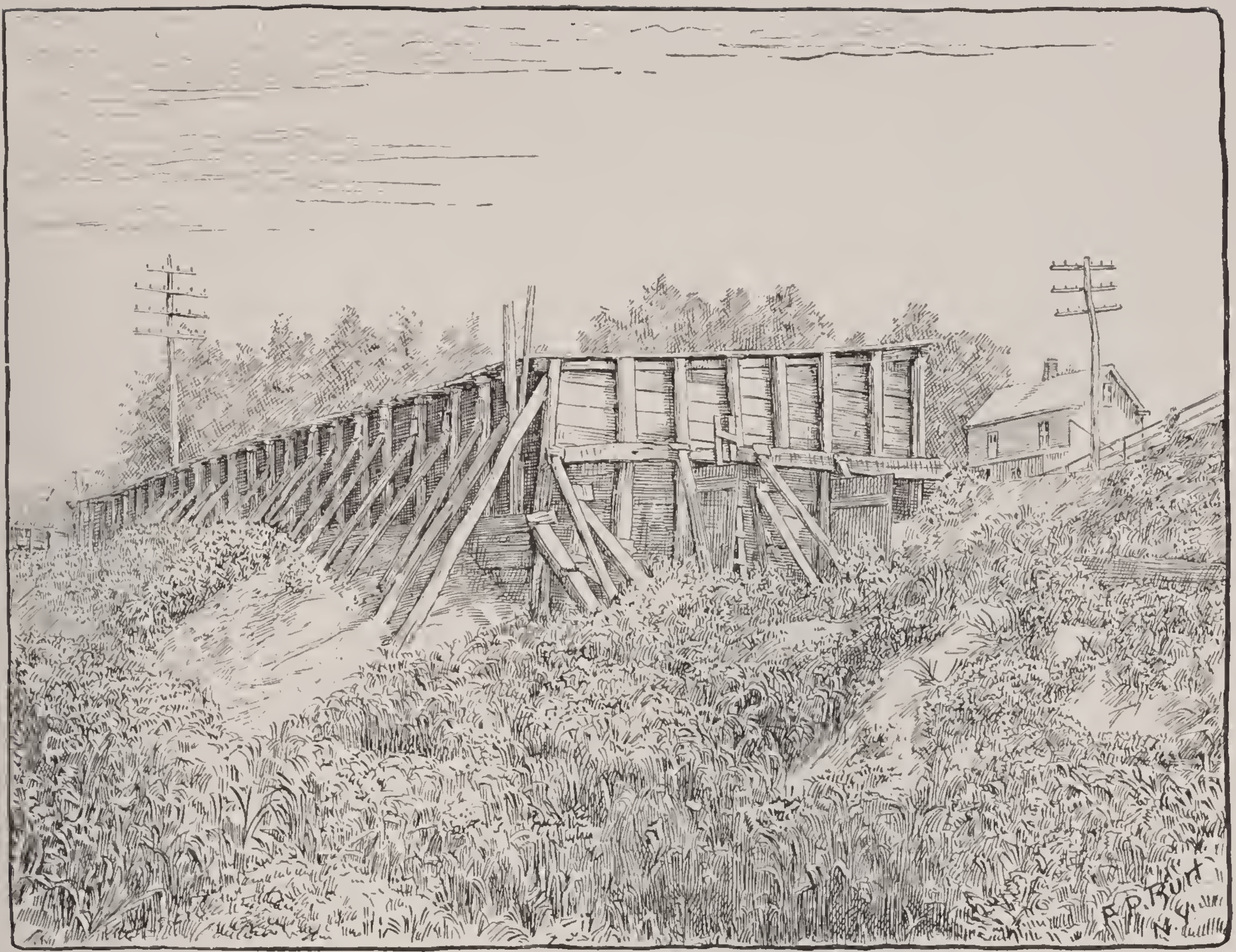
N 8.—Hotel and outbuildings on and over ditch in village of Mt. Kisco.

N 5.—Shop, outbuildings, barn, pig pen, etc., on and over brook in village of Mt. Kisco.

N 6.—Western portion of village of Mt. Kisco. Continuation of N 7 to the left.

N 7.—Eastern portion of flat part of village of Mt. Kisco. Continuation of N 6 to the right.

PLATE XXXI.



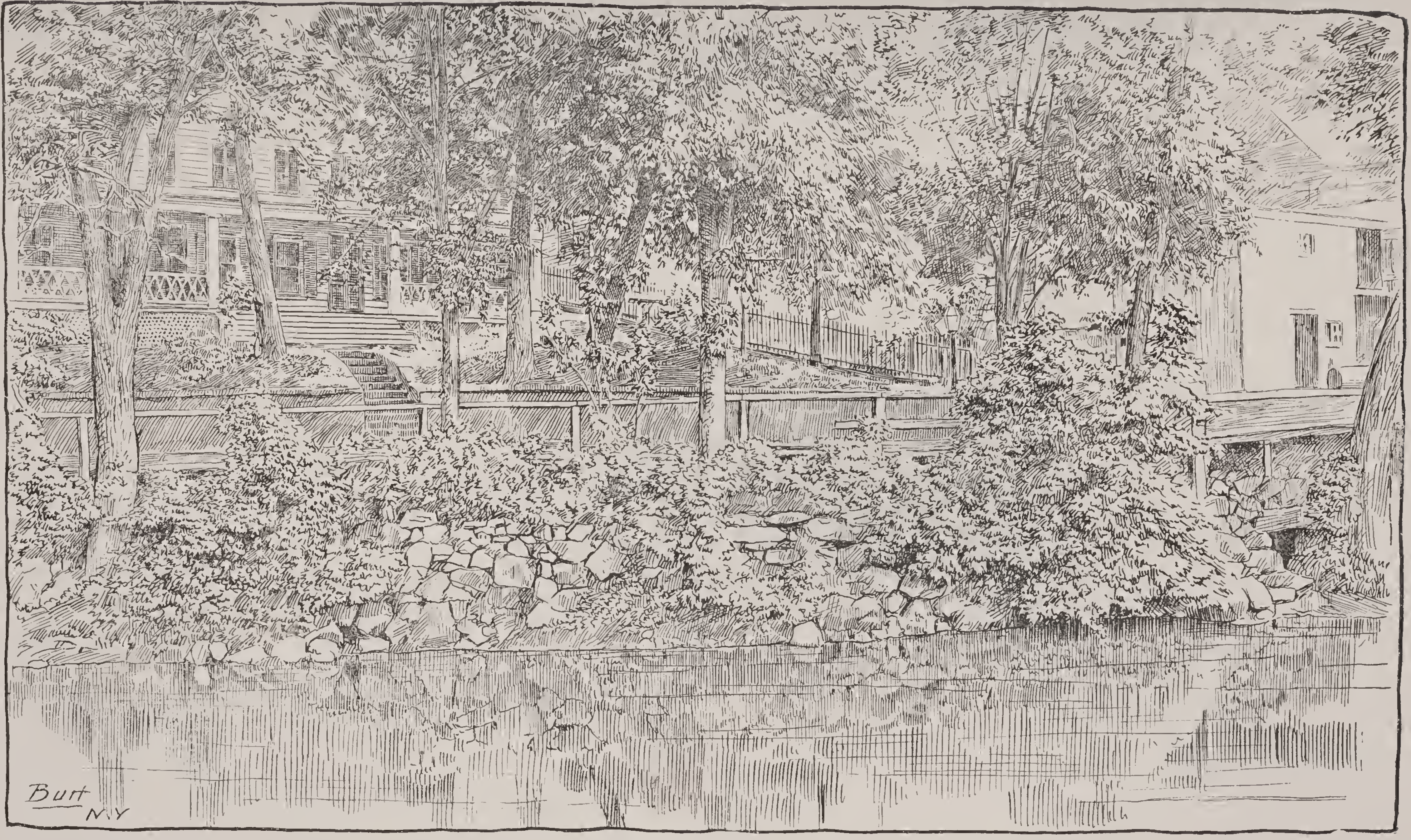
KATONAH, 1b.—Barley pit near shore line of new reservoir.

PLATE XXXII.

KATONAH, 2.—Slaughter-house, pens and barn on bank of Cross River.

KATONAH, 3.—Carriage shop and barn on bank of Cross River.

KATONAH, 4.—Houses, barns and outbuildings, and street on bank of Cross River.



KATONAH, 6.—House, barns and outbuildings on bank of Cross River. At extreme right is the outlet of a sewer or drain.

KATONAH, 9.—Houses and street on banks of Cross River. In center is outlet of surface drain from Main street.

KATONAH, 10.—Cemetery in rear of church. House and outbuildings on extreme right.

KATONAH, 11.—Mill pond. Houses, barns and outbuildings on bank. Level of new reservoir 15 or 20 feet above present level of pond.

PLATE XXXIX.

PURDYS, 1.—Barn, outbuilding and house on south bank of Titicus River.

PLATE XL.

PURDYS, 2.—Houses and outbuilding on north bank of Titicus River.

PURDYS, 3.—Barn, condensed milk factory and outbuildings on south bank of Titicus River.

PLATE XLII.

PURDYS, 4.—Shop, house and outbuildings on south bank of Titicus River.

CROTON FALLS, 2.—Barns, outbuildings and garbage dump on east bank of Croton River.

193

CROTON FALLS, 3.—General view of village. Croton River at foot of steep bank behind buildings.

YORKTOWN.—Village draining into swamp and creek in middle ground.

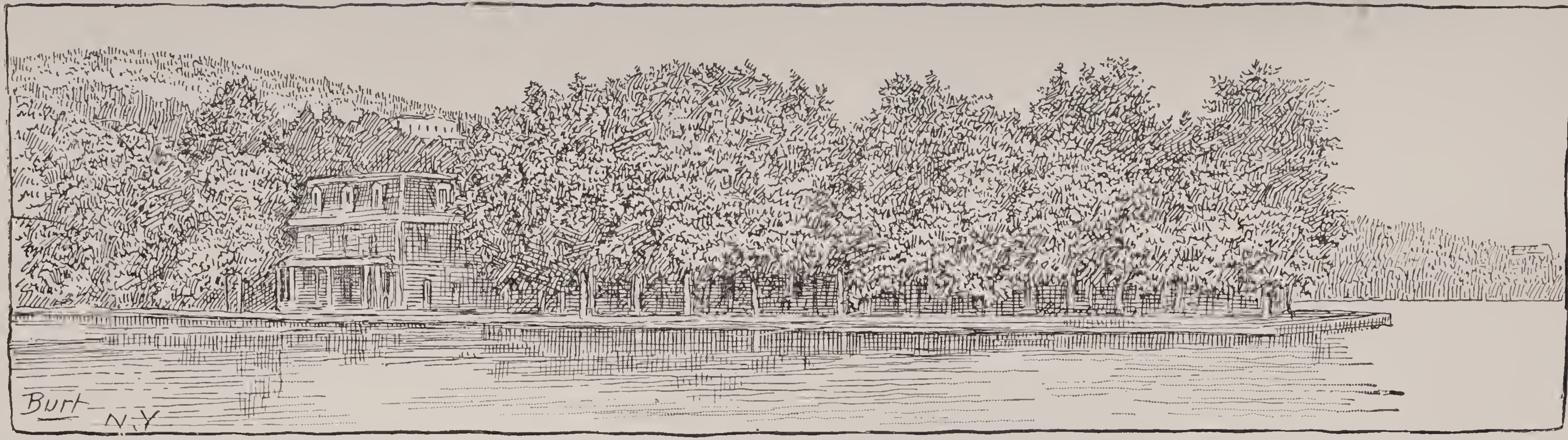
PLATE XLVI.

MAHOPAC, 4.—Southeasterly shore of Lake. Continuation of 3 to the right.

PLATE XLVII.

MAHOPAC, 5.—Southerly shore of Lake. Continuation of 4 to the right. Hotel buildings on water's edge.

PLATE XLVIII.



MAHOPAC, 7.—Buildings on small island off south shore of Lake.

PLATE XLIX.

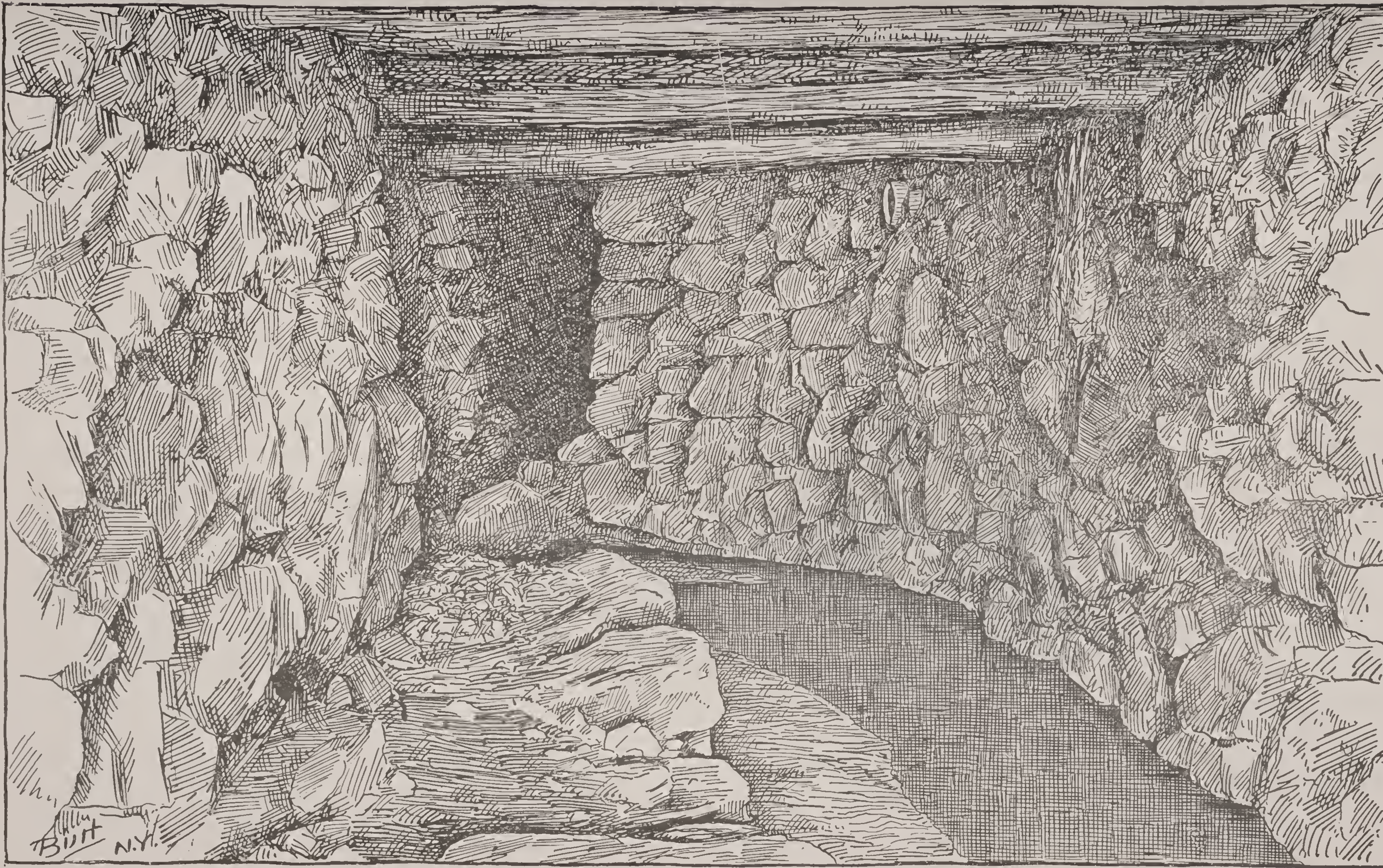
MAHOPAC, 8.—South shore of Lake. Continuation of 9 to the left.

BREWSTER, 2.—Southwest extension of village along east branch of Croton River. Bridge over river on extreme right.

BREWSTER, 3.—Southwest extension of village along east branch of Croton River. Continuation of 2 to right (northeast).

BREWSTER, 4.—Principal part of village. Continuation of 3 to the right.

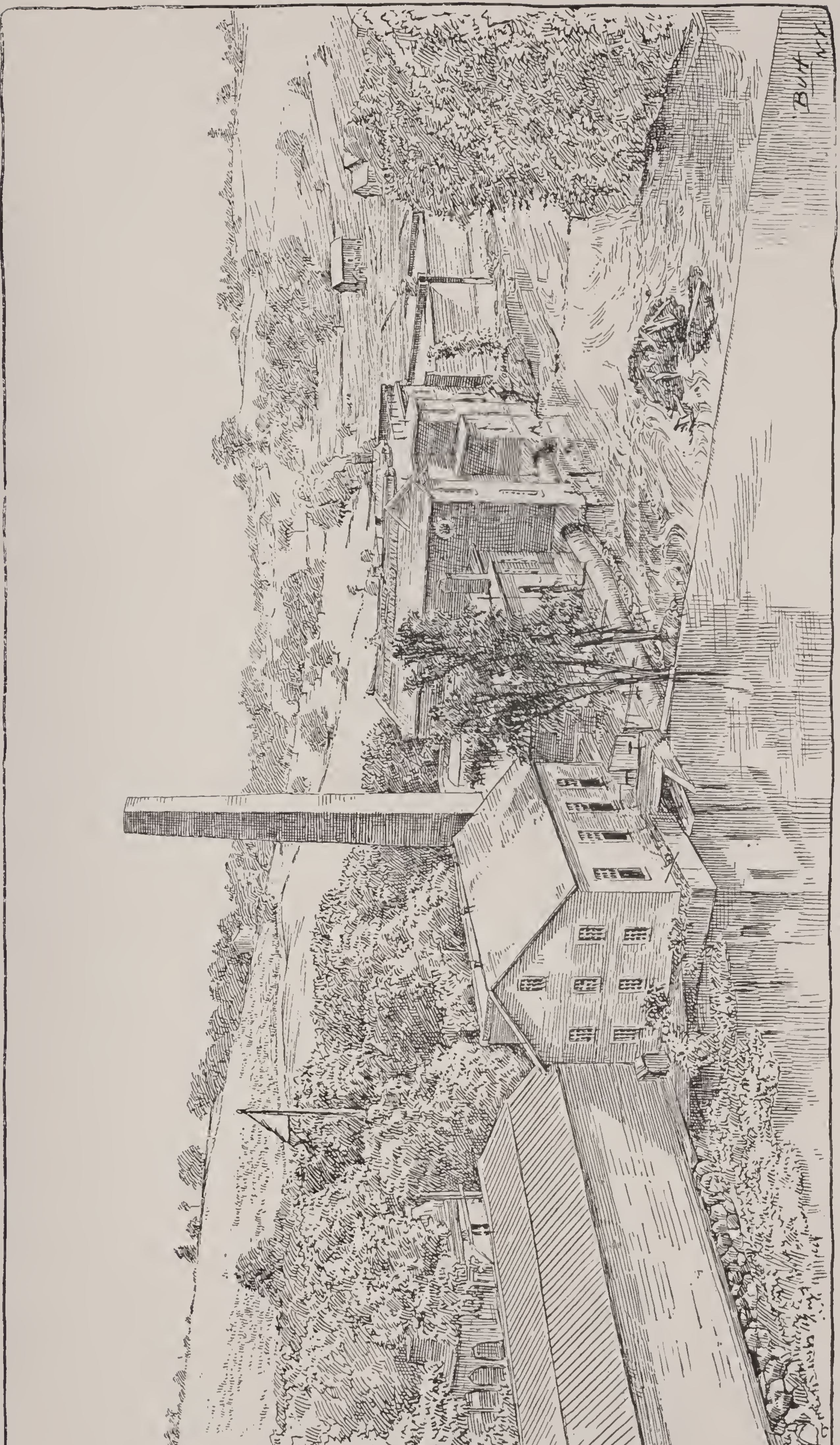
BREWSTER, 5.—View of rear of buildings in 3, showing drainage into river.



BREWSTER, 7.—Under the main street, showing the entrances of four sewers into Tonetta Brook.

BREWSTER, 8.—Rear of stores on south side of Main street, showing drainage into Tonetta Brook.

PLATE LVI.



BREWSTER, 9.—Condensed milk factory.

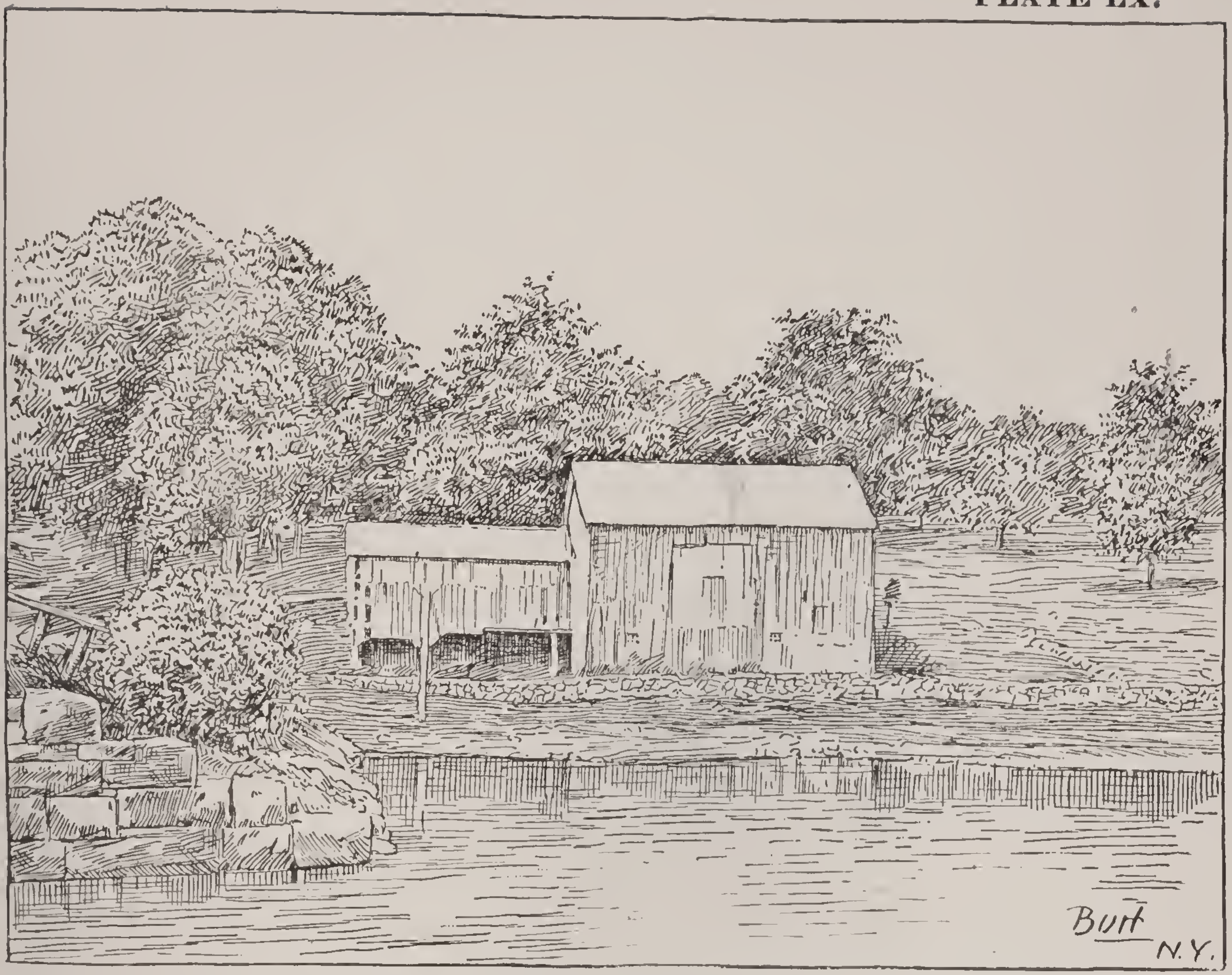
BREWSTER, 10.—Additional buildings of condensed milk factory. Continuation of 9 to the left from different point of view.

PLATE LVIII.

TILLY FOSTER, 1.—Iron mine buildings on peninsula in Middle Branch Reservoir from the east. Stables on bank in center.

PLATE LIX.

TILLY FOSTER, 2.—Mine buildings from the north.



TILLY FOSTER, 3.—Barn on west bank of Middle Branch Reservoir opposite iron mines.

PLATE LXI.

BREWSTER, 1.—Slaughter-house draining into low place in foreground, thence into Tonetta Brook.

CARMEL, 1.—General view of village, showing slopes of ground.

PLATE LXIII.

CARMEL, 2.—Buildings on east shore of Lake Gleneida.

PLATE LXIV.

CARMEL, 5.—Buildings on east shore of Lake Gleneida.

CARMEL, 6.—Buildings at northeast corner of Lake Gleneida.

COLE'S MILLS, 1.—Houses and mill over West Branch of Croton River.

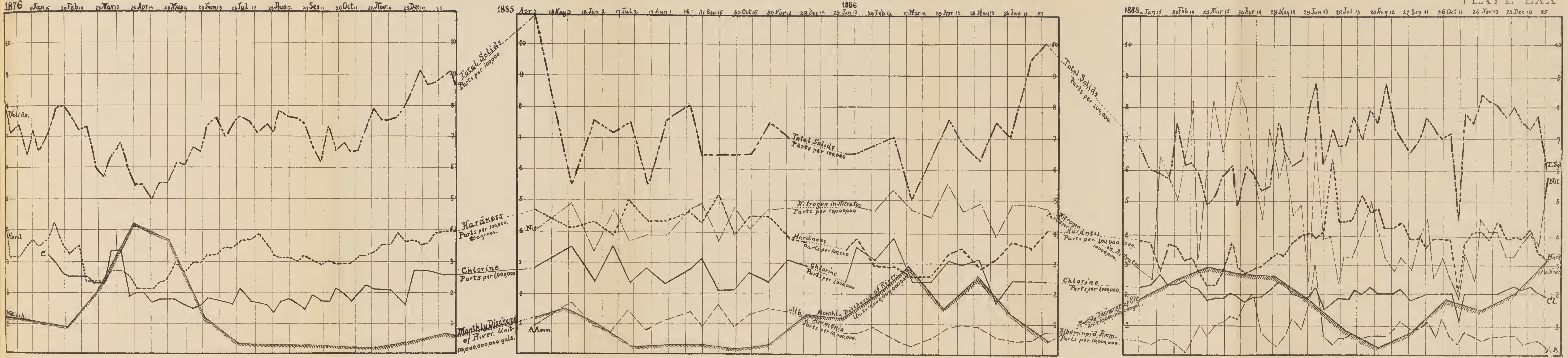
PLATE LXVII.

COLE'S MILLS, 2.—Barns and house on West Branch of Croton River.

BOYD'S CORNERS, 1.— Buildings on west shore of reservoir at Kent Cliffs postoffice.

BOYD'S CORNERS, 2.— Buildings on west shore of reservoir north of Kent Cliffs postoffice.

PLATE LXX



EXAMINATIONS OF CROTON WATER. 1876, 1885-6 AND 1888.